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ABSTRACT

This report on smoking and health, the twenty-third in a series that was begun in 1964, is the first in this series to focus on young people. It underscores the seriousness of tobacco use and its relationship to other adolescent problem behaviors. Examined here are the past few decades' scientific literature on the factors that influence the onset of use among young people and on strategies to prevent this onset. To better understand adolescent tobacco use, this report draws not only on medical and epidemiologic research, but also on behavioral and social investigations. The report is divided into six chapters. Chapter 1 provides a general summary, while chapter 2 concentrates on the health consequences of tobacco use by young people ages 10 through 18. Chapter 3 examines the epidemiologic patterns of tobacco use among the young; chapter 4 considers psychosocial risk factors, and chapter 5 analyzes the influence of tobacco advertising and promotion. The final chapter assesses what has been done--from the individual to the legislative level--to prevent tobacco use among young people. The report's major conclusions include evidence of nearly all first use of tobacco occurring before high school graduation and data on nicotine addiction in adolescents. (Contains a glossary, an index, and approximately 400 references.) (RJM)

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Preventing Tobacco Use Among Young People

A Report of the Surgeon General

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Center for Chronic Disease Prevention and Health Promotion
Office on Smoking and Health

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Preventing Tobacco Use Among Young People

A Report of the Surgeon General

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THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

The Honorable Thomas S. Foley
Speaker of the House of Representatives
Washington, D.C. 20515

Dear Mr. Speaker:

It is my pleasure to transmit to the Congress the Surgeon General's report on the health consequences of smoking entitled Preventing Tobacco Use Among Young People. This report is mandated by section 8(a) of the Public Health Cigarette Smoking Act of 1969 (Public Law 91-222) and includes the health effects of smokeless tobacco products as mandated by section 8(a) of the Comprehensive Smokeless Tobacco Health Education Act of 1986 (Public Law 99-252). The report was prepared by the Centers for Disease Control and Prevention's Office on Smoking and Health.

This report focuses on the vulnerable adolescent ages of 10 through 18 when most users start smoking, chewing, or dipping and become addicted to tobacco. It examines the health effects of early smoking and smokeless tobacco use, the reasons that young men and women begin using tobacco, the extent to which they use it, and efforts to prevent tobacco use by young people.

Smoking kills 434,000 Americans each year. Adolescent smoking and smokeless tobacco use are the first steps in this totally preventable public health tragedy. The facts are simple: one out of three adolescents in the United States is using tobacco by age 18, adolescent users become adult users, and few people begin to use tobacco after age 18. Preventing young people from starting to use tobacco is the key to reducing the death and disease caused by tobacco use. This report documents that intervention programs targeting the broad social environment of adolescents are both effective and warranted.

A great opportunity lies before us to prevent millions of premature deaths and improve the quality of lives. This report points out the overwhelming need in public health for efforts directed toward stopping young people before they start using tobacco.

Sincerely,

Donna E. Shalala

Enclosure

THE SECRETARY OF HEALTH AND HUMAN SERVICES
WASHINGTON, D.C. 20201

The Honorable Albert Gore, Jr.
President of the Senate
Washington, D.C. 20510

Dear Mr. President:

It is my pleasure to transmit to the Congress the Surgeon General's report on the health consequences of smoking entitled Preventing Tobacco Use Among Young People. This report is mandated by section 8(a) of the Public Health Cigarette Smoking Act of 1969 (Public Law 91-222) and includes the health effects of smokeless tobacco products as mandated by section 8(a) of the Comprehensive Smokeless Tobacco Health Education Act of 1986 (Public Law 99-252). The report was prepared by the Centers for Disease Control and Prevention's Office on Smoking and Health.

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Sincerely,

Donna E. Shalala

Enclosure

Foreword

This Surgeon General's report on smoking and health is the twenty-third in a series that was begun in 1964 and mandated by federal law in 1969. This report is the first in this series to focus on young people. It underscores the seriousness of tobacco use, its relationship to other adolescent problem behaviors, and the responsibility of all citizens to protect the health of our children.

Since 1964, substantial changes have occurred in scientific knowledge of the health consequences of smoking and smokeless tobacco use. Much more is also known about programs and policies that encourage nonsmoking behavior among adults and protect nonsmokers from exposure to environmental tobacco smoke. Although considerable gains have been made against smoking among U.S. adults, this progress has not been realized with young people. Onset rates of cigarette smoking among our youth have not declined over the past decade, and 28 percent of the nation's high school seniors are currently cigarette smokers.

The onset of tobacco use occurs primarily in early adolescence, a developmental stage that is several decades removed from the death and disability that are associated with smoking and smokeless tobacco use in adulthood. Currently, very few people begin to use tobacco as adults; almost all first use has occurred by the time people graduate from high school. The earlier young people begin using tobacco, the more heavily they are likely to use it as adults, and the longer potential time they have to be users. Both the duration and the amount of tobacco use are related to eventual chronic health problems. The processes of nicotine addiction further ensure that many of today's adolescent smokers will regularly use tobacco when they are adults.

Preventing smoking and smokeless tobacco use among young people is critical to ending the epidemic of tobacco use in the United States. This report examines the past few decades' extensive scientific literature on the factors that influence the onset of use among young people and on strategies to prevent this onset. To better understand adolescent tobacco use, this report draws not only on medical and epidemiologic research but also on behavioral and social investigations. The resulting examination of the advertising and promotional activities of the tobacco industry, as well as the review of research on the effects of these activities on young people, marks an important contribution to our understanding of the epidemic of tobacco use in the United States and elsewhere. In particular, this research on the social environment of young people identifies key risk factors that encourage tobacco use. The careful targeting of these risk factors—on a communitywide basis—has proven successful in preventing the onset and development of tobacco use among young people.

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Preface

from the Surgeon General,
U.S. Department of Health and Human Services

The public health movement against tobacco use will be successful when young people no longer want to smoke. We are not there yet. Despite 30 years of decline in overall smoking prevalence, despite widespread dissemination of information about smoking, despite a continuing decline in the social acceptability of smoking, substantial numbers of young men and women begin to smoke and become addicted. These current and future smokers are new recruits in the continuing epidemic of disease, disability, and death attributable to tobacco use. When young people no longer want to smoke, the epidemic itself will die.

This report of the Surgeon General, *Preventing Tobacco Use Among Young People,* delineates the problem in no uncertain terms. The direct effects of tobacco use on the health of young people have been greatly underestimated. The long-term effects are, of course, well established. The addictive nature of tobacco use is also well known, but it is perhaps less appreciated that early addiction is the chief mechanism for renewing the pool of smokers. Most people who are going to smoke are hooked by the time they are 20 years old.

Young people face enormous pressures to smoke. The tobacco industry devotes an annual budget of nearly $4 billion to advertising and promoting cigarettes. As this report so well describes, there has been a continuing shift from advertising to promotion, largely because of banning cigarette ads from broadcast media. The effect of the ban is dubious, however, since the use of promotional materials, the sponsoring of sports events, and the use of logos in nontraditional venues may actually be more effective in reaching target audiences. Clearly, young people are being indoctrinated with tobacco promotion at a susceptible time in their lives.

A misguided debate has arisen about whether tobacco promotion "causes" young people to smoke—misguided because single-source causation is probably too simple an explanation for any social phenomenon. The more important issue is what effect tobacco promotion might have. Current research suggests that pervasive tobacco promotion has two major effects: it creates the perception that more people smoke than actually do, and it provides a conduit between actual self-image and ideal self-image—in other words, smoking is made to look cool. Whether causal or not, these effects foster the uptake of smoking, initiating for many a dismal and relentless chain of events.

On the brighter side, a large portion of this report is devoted to countervailing influences. We have the justification: there is a substantial scientific basis for primary prevention of cigarette smoking and smokeless tobacco use. A number of successful prevention programs, based on the psychological and behavioral factors that create susceptibility to smoking, are available. We have the means: the report defines a coordinated, effective, nonsmoking public health program for young people. And we have the will: schools, communities, legislatures, and public opinion all testify to the growing support for encouraging young people to avoid tobacco use.

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This report was prepared by the Department of Health and Human Services under the general direction of the Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

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Introduction

Previous Surgeon General's reports on tobacco use and health have largely focused on the epidemiologic, clinical, biologic, and pharmacologic aspects of adult use of tobacco products. This report on *Preventing Tobacco Use Among Young People* provides a more detailed look at adolescence, the time of life when most tobacco users begin, develop, and establish their behavior. Because regular use soon results in addiction to nicotine, this behavior may persist through adulthood, significantly increasing, through the extended years of use, the risk of long-term, severe health consequences.

Despite three decades of explicit health warnings, large numbers of young people continue to take up tobacco; currently, over three million adolescents smoke cigarettes, and over one million adolescent males currently use smokeless tobacco. Clearly, effective interventions are needed to prevent more young people from trying tobacco. To achieve significant long-term reductions in tobacco use and tobacco-related deaths in the United States, we must examine the nature and scope of adolescent tobacco use, consider the social, psychological, and marketing factors that influence young people in their decision to use tobacco products, and evaluate current efforts to prevent young people from becoming users. This report addresses the crucial problems of adolescent tobacco use.

Development of the Report

This report of the Surgeon General was prepared by the Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Public Health Service, U.S. Department of Health and Human Services, as part of the department's responsibility, under Public Law 91-222 and Public Law 99-252, to report current information on the health effects of cigarette smoking and smokeless tobacco use to the United States Congress. This report is the first to focus on the problem of tobacco use among young people. Given the continuing onset of use in adolescence and the growing evidence of health consequences associated with early use, the report was seen as both needed and timely.

The current report has been produced through the efforts of experts in the medical, pharmacologic, epidemiologic, developmental, economic, behaviorai, legal, and public health aspects of smoking and smokeless tobacco use among young people. Initial manuscripts for the report were prepared by 28 scientists who were selected for their expertise in specific content areas. This material was consolidated into chapters, each of which underwent peer review. The entire document was reviewed by a number of experts in the field, as well as by institutes and agencies within the U.S. Public Health Service. The final draft of the report was reviewed by the Assistant Secretary for Health and by the Secretary, Department of Health and Human Services.

Several concerns guided the development of this report. The first, which is addressed in Chapter 2, is whether tobacco use is associated with health consequences during the period of adolescence (broadly defined as ages 10 through 18, although research cited in this report varies somewhat in the ages considered adolescent). The long-term health consequences—that is, those that emerge in adulthood—have been the subject of extensive review and are widely acknowledged in the scientific and public literature. The chapter thus focuses on the serious health consequences, as well as the increased risk factors for subsequent health consequences, that are evident early in life among young smokers and smokeless tobacco users. Chapter 3 examines the epidemiologic patterns of tobacco use among the young. National data on trends in adolescent use are analyzed to determine the extent of the current problem, as well as to note changes in patterns of initiation and use. The factors that influence adolescents in their decision to use tobacco are examined in Chapter 4, which considers psychosocial risk factors, and Chapter 5, which examines the influence of tobacco advertising and promotion. The final concern, the focus of Chapter 6, was to assess what has been done—from the individual level to the legislative level—to prevent tobacco use among young people.

Major Conclusions

1. Nearly all first use of tobacco occurs before high school graduation; this finding suggests that if adolescents can be kept tobacco-free, most will never start using tobacco.
2. Most adolescent smokers are addicted to nicotine and report that they want to quit but are unable to do so; they experience relapse rates and withdrawal symptoms similar to those reported by adults.
3. Tobacco is often the first drug used by those young people who use alcohol, marijuana, and other drugs.

4. Adolescents with lower levels of school achievement, with fewer skills to resist pervasive influences to use tobacco, with friends who use tobacco, and with lower self-images are more likely than their peers to use tobacco.
5. Cigarette advertising appears to increase young people's risk of smoking by affecting their perceptions of the pervasiveness, image, and function of smoking.
6. Communitywide efforts that include tobacco tax increases, enforcement of minors' access laws, youth-oriented mass media campaigns, and school-based tobacco-use prevention programs are successful in reducing adolescent use of tobacco.

Summary

Introduction

The health effects of cigarette smoking have been the subject of intensive investigation since the 1950s. Cigarette smoking is still considered the chief preventable cause of premature disease and death in the United States. As was documented extensively in previous Surgeon General's reports, cigarette smoking has been causally linked to lung cancer and other fatal malignancies, atherosclerosis and coronary heart disease, chronic obstructive pulmonary disease, and other conditions that constitute a wide array of serious health consequences (USDHHS 1989). More recent studies have concluded that passive (or involuntary) smoking can cause disease, including lung cancer, in healthy nonsmokers. In 1986, an advisory committee appointed by the Surgeon General released a special report on the health consequences of smokeless tobacco, concluding that smokeless tobacco use can cause cancer and can lead to nicotine addiction (USDHHS 1986). In the 1988 report, nicotine was designated a highly addictive substance, comparable in its physiological and psychological properties to other addictive substances of abuse (USDHHS 1988).

Considerable evidence indicates that the health problems associated with smoking are a function of the duration (years) and the intensity (amount) of use. The younger one begins to smoke, the more likely one is to be a current smoker as an adult. Earlier onset of cigarette smoking and smokeless tobacco use provides more life-years to use tobacco and thereby increases the potential duration of use and the risk of a range of more serious health consequences. Earlier onset is also associated with heavier use; those who begin to use tobacco as younger adolescents are among the heaviest users in adolescence and adulthood. Heavier users are more likely to experience tobacco-related health problems and are the least likely to quit smoking cigarettes or using smokeless tobacco. Preventing tobacco use among young people is therefore likely to affect both duration and intensity of total use of tobacco, potentially reducing long-term health consequences significantly.

Health Consequences of Tobacco Use Among Young People

Active smoking by young people is associated with significant health problems during childhood and adolescence and with increased risk factors for health problems in adulthood. Cigarette smoking during adolescence appears to reduce the rate of lung growth and the level of maximum lung function that can be achieved. Young smokers are likely to be less physically fit than young nonsmokers; fitness levels are inversely related to the duration and the intensity of smoking. Adolescent smokers report that they are significantly more likely than their nonsmoking peers to experience shortness of breath, coughing spells, phlegm production, wheezing, and overall diminished physical health. Cigarette smoking during childhood and adolescence poses a clear risk for respiratory symptoms and problems during adolescence; these health problems are risk factors for other chronic conditions in adulthood, including chronic obstructive pulmonary disease.

Cardiovascular disease is the leading cause of death among adults in the United States. Atherosclerosis, however, may begin in childhood and become clinically significant by young adulthood. Cigarette smoking has been shown to be a primary risk factor for coronary heart disease, arteriosclerotic peripheral vascular disease, and stroke. Smoking by children and adolescents is associated with an increased risk of early atherosclerotic lesions and increased risk factors for cardiovascular diseases. These risk factors include increased levels of low-density lipoprotein cholesterol, increased very-low-density lipoprotein cholesterol, increased triglycerides, and reduced levels of high-density lipoprotein cholesterol. If sustained into adulthood, these patterns significantly increase the risk for early development of cardiovascular disease.

Smokeless tobacco use is associated with health consequences that range from halitosis to severe health problems such as various forms of oral cancer. Use of smokeless tobacco by young people is associated with early indicators of adult health consequences, including periodontal degeneration, soft tissue lesions, and general systemic alterations. Previous reports have documented that smokeless tobacco use is as addictive for young people as it is for adults. Another concern is that smokeless tobacco users are more likely than nonusers to become cigarette smokers.

Among addictive behaviors such as the use of alcohol and other drugs, cigarette smoking is most likely to become established during adolescence. Young people who begin to smoke at an earlier age are more likely than later starters to develop long-term nicotine addiction. Most young people who smoke regularly are already addicted to nicotine, and they experience this addiction in a manner and severity similar to what adult smokers experience. Most adolescent smokers report that they would like to quit smoking and that they have made numerous, usually unsuccessful attempts to quit. Many adolescents say that they intend to quit in the future and yet prove unable to do so. Those who try to quit smoking report withdrawal symptoms similar to those reported by adults. Adolescents are difficult to recruit for formal cessation programs, and when enrolled, are difficult to retain in the programs. Success rates in adolescent cessation programs tend to be quite low, both in absolute terms and relative to control conditions.

Tobacco use is associated with a range of problem behaviors during adolescence. Smokeless tobacco or cigarettes are generally the first drug used by young people in a sequence that can include tobacco, alcohol, marijuana, and hard drugs. This pattern does not imply that tobacco use causes other drug use, but rather that other drug use rarely occurs before the use of tobacco. Still, there are a number of biological, behavioral, and social mechanisms by which the use of one drug may facilitate the use of other drugs, and adolescent tobacco users are substantially more likely to use alcohol and illegal drugs than are nonusers. Cigarette smokers are also more likely to get into fights, carry weapons, attempt suicide, and engage in high-risk sexual behaviors. These problem behaviors can be considered a syndrome, since involvement in one behavior increases the risk for involvement in others. Delaying or preventing the use of tobacco may have implications for delaying or preventing these other behaviors as well.

The Epidemiology of Tobacco Use Among Young People

Overall, about one-third of high-school-aged adolescents in the United States smoke or use smokeless tobacco. Smoking prevalence among U.S. adolescents declined sharply in the 1970s, but this decline slowed significantly in the 1980s, particularly among white males. Although female adolescents during the 1980s were more likely than male adolescents to smoke, female and male adolescents are now equally likely to smoke. Male adolescents are substantially more likely than females to use smokeless tobacco products; about 20 percent of high school males report current use, whereas only about 1 percent of females do. White adolescents are more likely to smoke and to use smokeless tobacco than are black and Hispanic adolescents.

Sociodemographic, environmental, behavioral, and personal factors can encourage the onset of tobacco use among adolescents. Young people from families with lower socioeconomic status, including those adolescents living in single-parent homes, are at increased risk of initiating smoking. Among environmental factors, peer influence seems to be particularly potent in the early stages of tobacco use; the first tries of cigarettes and smokeless tobacco occur most often with peers, and the peer group may subsequently provide expectations, reinforcement, and cues for experimentation. Parental tobacco use does not appear to be as compelling a risk factor as peer use; on the other hand, parents may exert a positive influence by disapproving of smoking, being involved in children's free time, discussing health matters with children, and encouraging children's academic achievement and school involvement.

How adolescents perceive their social environment may be a stronger influence on behavior than the actual environment. For example, adolescents consistently overestimate the number of young people and adults who smoke. Those with the highest overestimates are more likely to become smokers than are those with more accurate perceptions. Similarly, those who perceive that cigarettes are easily accessible and generally available are more likely to begin smoking than are those who perceive more difficulty in obtaining cigarettes.

Behavioral factors figure heavily during adolescence, a period of multiple transitions to physical maturation, to a coherent sense of self, and to emotional independence. Adolescents are thus particularly vulnerable to a range of hazardous behaviors and activities, including tobacco use, that may seem to assist in these transitions. Young people who report that smoking serves positive functions or is potentially useful are at increased risk for smoking. These functions are associated with bonding with peers, being independent and mature, and having a positive social image. Since reports from adolescents who begin to smoke indicate that they have lower self-esteem and lower self-images than their nonsmoking peers, smoking can become a self-enhancement mechanism. Similarly, not having the confidence to be able to resist peer offers of tobacco seems to be an important risk factor for initiation. Intentions to use tobacco and actual experimentation also strongly predict subsequent regular use.

The positive functions that many young people attribute to smoking are the same functions advanced in most cigarette advertising. Young people are a strategically important market for the tobacco industry. Since most smokers try their first cigarette before age 18, young people are the chief source of new consumers for the tobacco industry, which each year must replace the many consumers who quit smoking and the many who die from smoking-related diseases. Despite restrictions on tobacco marketing, children and adolescents continue to be exposed to cigarette advertising and promotional activities, and young people report considerable familiarity with many cigarette advertisements. In the past, this exposure was accomplished by radio and television programs sponsored by the cigarette industry. Barred since 1971 from using broadcast media, the tobacco industry increasingly relies on promotional activities, including sponsorship of sports events and public entertainment, outdoor billboards, point-of-purchase displays, and the distribution of specialty items that appeal to the young. Cigarette advertisements in the print media persist; these messages have become increasingly less informational, replacing words with images to portray the attractiveness and function of smoking. Cigarette advertising frequently uses human models or human-like cartoon characters to display images of youthful activities, independence, healthfulness, and adventure-seeking. In presenting attractive images of smokers, cigarette advertisements appear to stimulate some adolescents who have relatively low self-images to adopt smoking as a way to improve their own self-image. Cigarette advertising also appears to affect adolescents' perceptions of the pervasiveness of smoking, images of smokers, and the function of smoking. Since these perceptions are psychosocial risk factors for the initiation of smoking, cigarette advertising appears to increase young people's risk of smoking.

Efforts to Prevent the Onset of Tobacco Use

Most of the U.S. public strongly favors policies that might prevent tobacco use among young people. These policies include mandated tobacco education in schools, a complete ban on smoking by anyone on school grounds, further restrictions on tobacco advertising and promotional activities, stronger prohibitions on the sale of tobacco products to minors, and increases in earmarked taxes on tobacco products. Interventions to prevent initiation among young people—even actions that involve restrictions on adult smoking or increased taxes—have received strong support among smoking and nonsmoking adults.

Numerous research studies over the past 15 years suggest that organized interventions can help prevent the onset of smoking and smokeless tobacco use. School-based smoking-prevention programs, based on a model of identifying social influences on smoking and providing skills to resist those influences, have demonstrated consistent and significant reductions in adolescent smoking prevalence; these program effects have lasted one to three years. Programs to prevent smokeless tobacco use have used a similar model to achieve modest reductions in initiation of use. The effectiveness of these school-based programs appears to be enhanced and sustained, at least until high school graduation, by adding coordinated communitywide programs that involve parents, youth-oriented mass media and counteradvertising, community organizations, or other elements of adolescents' social environments.

A crucial element of prevention is access: adolescents should not be able to purchase tobacco products in their communities. Active enforcement of age-at-sale policies by public officials and community members appears necessary to prevent minors' access to tobacco. Communities that have adopted tighter restrictions have achieved reductions in purchases by minors. At the state and national levels, price increases have significantly reduced cigarette smoking; the young have been at least as responsive as adults to these price changes. Maintaining higher real prices of cigarettes provides a barrier to adolescent tobacco use but depends on further tax increases to offset the effects of inflation. The results of this review thus suggest that a coordinated, multicomponent campaign involving policy changes, taxation, mass media, and behavioral education can effectively reduce the onset of tobacco use among adolescents.

Summary

Smoking and smokeless tobacco use are almost always initiated and established in adolescence. Besides its long-term effects on adults, tobacco use produces specific health problems for adolescents. Since nicotine addiction also occurs during adolescence, adolescent tobacco users are likely to become adult tobacco users. Smoking and smokeless tobacco use are associated with other problem behaviors and occur early in the sequence of these behaviors. The outcomes of adolescent smoking and smokeless tobacco use continue to be of great public health importance, since one out of three U.S. adolescents uses tobacco by age 18. The social environment of adolescents, including the functions, meanings, and images of smoking that are conveyed through cigarette advertising, sets the stage for adolescents to begin using tobacco. As tobacco products are available and as peers begin to try them, these factors become personalized and relevant, and tobacco use may begin. This process most affects adolescents who, compared with their peers, have lower self-esteem and self-images, are less involved with school and academic achievement, have fewer skills to resist the offers of peers, and come from homes with lower socioeconomic status. Tobacco-use prevention programs that target the larger social environment of adolescents are both efficacious and warranted.

Chapter Conclusions

Following are the specific conclusions for each chapter of this report:

Chapter 2. The Health Consequences of Tobacco Use by Young People

1. Cigarette smoking during childhood and adolescence produces significant health problems among young people, including cough and phlegm production, an increased number and severity of respiratory illnesses, decreased physical fitness, an unfavorable lipid profile, and potential retardation in the rate of lung growth and the level of maximum lung function.
2. Among addictive behaviors, cigarette smoking is the one most likely to become established during adolescence. People who begin to smoke at an early age are more likely to develop severe levels of nicotine addiction than those who start at a later age.
3. Tobacco use is associated with alcohol and illicit drug use and is generally the first drug used by young people who enter a sequence of drug use that can include tobacco, alcohol, marijuana, and harder drugs.
4. Smokeless tobacco use by adolescents is associated with early indicators of periodontal degeneration and with lesions in the oral soft tissue. Adolescent smokeless tobacco users are more likely than nonusers to become cigarette smokers.

Chapter 3. Epidemiology of Tobacco Use Among Young People in the United States

1. Tobacco use primarily begins in early adolescence, typically by age 16; almost all first use occurs before the time of high school graduation.
2. Smoking prevalence among adolescents declined sharply in the 1970s, but the decline slowed significantly in the 1980s. At least 3.1 million adolescents and 25 percent of 17- and 18-year-olds are current smokers.
3. Although current smoking prevalence among female adolescents began exceeding that among males by the mid- to late-1970s, both sexes are now equally likely to smoke. Males are significantly more likely than females to use smokeless tobacco. Nationally, white adolescents are more likely to use all forms of tobacco than are blacks and Hispanics. The decline in the prevalence of cigarette smoking among black adolescents is noteworthy.
4. Many adolescent smokers are addicted to cigarettes; these young smokers report withdrawal symptoms similar to those reported by adults.
5. Tobacco use in adolescence is associated with a range of health-compromising behaviors, including being involved in fights, carrying weapons, engaging in higher-risk sexual behavior, and using alcohol and other drugs.

Chapter 4. Psychosocial Risk Factors for Initiating Tobacco Use

1. The initiation and development of tobacco use among children and adolescents progresses in five stages: from forming attitudes and beliefs about tobacco, to trying, experimenting with, and regularly using tobacco, to being addicted. This process generally takes about three years.
2. Sociodemographic factors associated with the onset of tobacco use include being an adolescent from a family with low socioeconomic status.
3. Environmental risk factors for tobacco use include accessibility and availability of tobacco products, perceptions by adolescents that tobacco use is

normative, peers' and siblings' use and approval of tobacco use, and lack of parental support and involvement as adolescents face the challenges of growing up.

4. Behavioral risk factors for tobacco use include low levels of academic achievement and school involvement, lack of skills required to resist influences to use tobacco, and experimentation with any tobacco product.
5. Personal risk factors for tobacco use include a lower self-image and lower self-esteem than peers, the belief that tobacco use is functional, and lack of self-efficacy in the ability to refuse offers to use tobacco. For smokeless tobacco use, insufficient knowledge of the health consequences is also a factor.

Chapter 5. Tobacco Advertising and Promotional Activities

1. Young people continue to be a strategically important market for the tobacco industry.
2. Young people are currently exposed to cigarette messages through print media (including outdoor billboards) and through promotional activities, such as sponsorship of sporting events and public entertainment, point-of-sale displays, and distribution of specialty items.
3. Cigarette advertising uses images rather than information to portray the attractiveness and function of smoking. Human models and cartoon characters in cigarette advertising convey independence, healthfulness, adventure-seeking, and youthful activities—themes correlated with psychosocial factors that appeal to young people.
4. Cigarette advertisements capitalize on the disparity between an ideal and actual self-image and imply that smoking may close the gap.
5. Cigarette advertising appears to affect young people's perceptions of the pervasiveness, image, and function of smoking. Since misperceptions in these areas constitute psychosocial risk factors for the initiation of smoking, cigarette advertising appears to increase young people's risk of smoking.

Chapter 6. Efforts to Prevent Tobacco Use Among Young People

1. Most of the American public strongly favor policies that might prevent tobacco use among young people. These policies include tobacco education in the schools, restrictions on tobacco advertising and promotions, a complete ban on smoking by anyone on school grounds, prohibition of the sale of tobacco products to minors, and earmarked tax increases on tobacco products.
2. School-based smoking-prevention programs that identify social influences to smoke and teach skills to resist those influences have demonstrated consistent and significant reductions in adolescent smoking prevalence, and program effects have lasted one to three years. Programs to prevent smokeless tobacco use that are based on the same model have also demonstrated modest reductions in the initiation of smokeless tobacco use.
3. The effectiveness of school-based smoking-prevention programs appears to be enhanced and sustained by comprehensive school health education and by communitywide programs that involve parents, mass media, community organizations, or other elements of an adolescent's social environment.
4. Smoking-cessation programs tend to have low success rates. Recruiting and retaining adolescents in formal cessation programs are difficult.
5. Illegal sales of tobacco products are common. Active enforcement of age-at-sale policies by public officials and community members appears necessary to prevent minors' access to tobacco.
6. Econometric and other studies indicate that increases in the real price of cigarettes significantly reduce cigarette smoking; young people are at least as responsive as adults to such price changes. Maintaining higher real prices of cigarettes depends on further tax increases to offset the effects of inflation.

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Chapter 2

The Health Consequences of Tobacco Use by Young People

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Introduction

The health consequences of tobacco use among adults have been reviewed extensively in previous Surgeon General's reports (Public Health Service [PHS] 1964; U.S. Department of Health and Human Services [USDHHS] 1986b, 1989). Among young people, the short-term health consequences of smoking include respiratory and nonrespiratory effects, addiction to a toxic substance (nicotine), and the associated risk of other drug use. Long-term health consequences of adolescent smoking may be seen in the association between early onset of tobacco use and future (adult) smoking, with concomitant health consequences. Passive (also called "involuntary") smoking during adolescence is also associated with harmful respiratory and nonrespiratory effects. Lastly, the use of smokeless tobacco poses serious health consequences to young people.

Health Consequences of Smoking Among Young People

Introduction

The health effects of cigarette smoking have been the subject of intensive investigation since the 1950s. Extensive evidence, documented in numerous reports of the Surgeon General, has causally linked cigarette smoking to a wide array of health outcomes that extend from annoying symptoms to fatal malignancies (USDHHS 1989). Until recently, this research was largely directed at the effects of smoking on adults. As is discussed in Chapter 3 (see "Age or Grade When Smoking Begins"), the onset and development of cigarette use occur primarily during adolescence (USDHHS 1989); the health consequences of smoking among young people thus have great public health significance. In recent years, investigations of the health effects in school-age youth have reported sufficient data to support conclusions about adverse effects of smoking during childhood and adolescence.

Most of the evidence reviewed here is gathered from epidemiologic studies of young people ranging from 10 through 20 years old. Selected studies that relate to older age groups, yet are relevant to young people, are also included. Emphasis is placed on the respiratory effects of smoking, for which the evidence is abundant. Data on smoking and cardiovascular risk factors and atherogenesis are also addressed, as are the adult health implications of starting to smoke during childhood.

Overview of the Toxicology of Tobacco Smoke

Cigarette smoke is a complex mixture of organic and inorganic compounds generated by the combustion of tobacco and additives. Current knowledge about the physicochemical nature of tobacco smoke is well described in earlier Surgeon General's reports (PHS 1964; USDHHS 1981, 1989). Thousands of individual compounds have been isolated in cigarette smoke, including pharmacologically active agents (e.g., nicotine), toxic agents (e.g., carbon monoxide, hydrogen cyanide, and acrolein), and mutagens and carcinogens (e.g., polycyclic aromatic hydrocarbons).

Cigarette smoke is further classified as mainstream smoke (MS), the smoke drawn through the mouthpiece of the cigarette, and sidestream smoke (SS), the smoke given off by smoldering tobacco between puffs and the smoke diffusing through the cigarette paper and escaping from the burning cone during puffing. Because of the differing combustion conditions under which MS and SS are generated, their chemical compositions differ; in particular, undiluted SS tends to have higher concentrations of many toxic and tumorigenic agents (USDHHS 1986a, 1989). The quantitative yields of tar (the material deposited in a filter as MS is being drawn), nicotine, and carbon monoxide from cigarettes can be assessed by using a smoking machine standardized to a particular pattern of puffing (USDHHS 1989).

Passive smoking refers to nonsmokers' inhalation of tobacco smoke. The term "environmental tobacco smoke" (ETS) is now widely used to refer to the mixture of predominantly SS and exhaled MS that is inhaled by the passive smoker. Passive smoking was the subject of the 1986 Surgeon General's report (USDHHS 1986a); that report reviews in detail the components of ETS, as did a contemporaneously prepared report of the National Research Council (1986). In 1991, the National Institute for Occupational Safety and Health recommended that ETS be regarded as a potential occupational carcinogen and that exposures to ETS be reduced to the lowest feasible concentration (USDHHS 1991b). A recent monograph by Guerin, Jenkins, and Tomkins (1992) updates and extends these earlier reviews. The U.S. Environmental Protection Agency (USEPA) also recently reviewed the evidence on involuntary smoking and respiratory health (USEPA 1992). These and other health consequences of passive smoking are discussed later in this chapter.

Many of the components of SS and MS have been identified in ETS. On the other hand, ETS is an inherently dynamic mixture that changes in physical and chemical characteristics as it ages and reacts with other pollutants in indoor air and with surfaces (USDHHS 1986a; Guerin, Jenkins, Tomkins 1992). The 1986 Surgeon General's report concluded, however, that ETS was sufficiently close to MS and SS to permit generalization of the evidence on the health consequences of active smoking to passive smoking (USDHHS 1986a).

The human body is most susceptible to these health consequences along cigarette smoke's path of ingress through the respiratory tract. The respiratory tract includes the upper airway (nose, oropharynx, and larynx) and the lung (airways and the parenchyma). The airways are lined by an epithelium that varies in form and function at different levels of the respiratory tract. The parenchyma includes the alveoli pulmonis (the delicate gas-exchanging surface of the lung) and the interstitium (the location of the blood and lymphatic vessels and of the lung's supporting connective tissue).

The effects of active[1] cigarette smoking on these structures of the lung and on many physiological functions of the lung have been extensively studied (USDHHS 1984, 1990; Bates 1989). Changes in lung physiology attributable to smoking include the weakening of an individual's defenses against infectious organisms and inhaled particles and gases, changes in the numbers and types of cells present within the lung, and the activation of potentially damaging proteolytic enzymes and the inactivation of the proteins that inhibit them. Many of these effects of smoking have been demonstrated in young adult smokers who have served as volunteer research subjects (USDHHS 1984).

The effects of smoking on lung structure and function have been demonstrated repeatedly in young adult smokers (USDHHS 1984; Bates 1989). Studies using spirometry, tests of small airway function, and lung volume measurements have shown a higher frequency of abnormalities in smokers than nonsmokers (USDHHS 1984; Bates 1989). Effects of smoking on lung structure, particularly the small airways, have been found in smokers in their mid-twenties. Niewoehner, Kleinerman, and Rice (1974) examined peripheral airways of 20 nonsmokers and 19 smokers who had died from nonrespiratory causes at an average age of 25. A characteristic lesion, termed "respiratory bronchiolitis," was found in all 19 of the smokers but in only 5 of the nonsmokers. The affected small airways of the smokers demonstrated an inflammatory process consisting of aggregates of pigment-containing macrophages with edema, fibrosis, and epithelial hyperplasia in adjacent bronchioles and alveoli.

These observations on the effects of smoking in young people are consistent with current concepts of pathogenesis and natural history in adult smokers (USDHHS 1984, 1990). Severe chronic airflow obstruction, sufficient to result in a clinical diagnosis of chronic obstructive pulmonary disease (COPD), follows sustained smoking and lung injury with progressive loss of respiratory function through adulthood. In smokers who develop COPD, decline of lung function at a rate well beyond that associated with aging alone eventually leads to impairment. Changes in lung function can be demonstrated in young adult smokers; these losses are consistent with the histopathologic evidence that the small airways of young smokers are damaged (USDHHS 1984).

Epidemiologic Evidence of Respiratory Effects

Respiratory Symptoms

The cardinal symptoms of respiratory tract injury and disease are cough, sputum production, wheezing, and dyspnea (or shortness of breath). In epidemiologic studies of respiratory diseases, symptoms are usually discovered through responses to a standardized questionnaire (Samet 1978). In adults, the occurrence of cough and phlegm is causally associated with cigarette smoking; the frequency of the symptoms rises with the number of cigarettes smoked per day (USDHHS 1984). In some studies, wheezing is also more frequent in adult smokers than in adults who have never smoked (Schenker, Samet, Speizer 1982). The frequency of dyspnea rises as the extent of smoking-related impairment of lung function increases (Samet 1978).

Questionnaire-based epidemiologic studies of children and adolescents document that smoking is also a cause of respiratory symptoms in preteen and teenage regular smokers (those who smoke at least weekly). Studies conducted from the 1960s through the 1980s involving thousands of children provide consistent evidence that smoking is associated with the occurrence of cough and phlegm (Table 1; see Table 31 in Chapter 3 for additional data). In several studies, smoking also increased the frequency of wheezing and dyspnea. These associations have been found in studies conducted in the

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[1] Unless otherwise indicated, "smoking" will hence refer to active smoking.

United States, the United Kingdom, New Zealand, and Scandinavia and at levels of smoking as low as one cigarette per week.

In one of the first studies on smoking and respiratory symptoms in children, Holland and Elliott (1968) administered a questionnaire concerning respiratory symptoms and cigarette smoking to all children in schools in four areas of southeast England. Smoking education was then provided to half of the schools, and the questionnaire was readministered one year later. Although the intervention had no effect on the prevalence of smoking, the study documented that smoking in childhood was associated with cough and phlegm and that these symptoms were reduced in those who had stopped smoking.

Many later studies continued to show that smoking increased the frequency of respiratory symptoms in children and adolescents. In the United States, research with high school students (Addington et al. 1970; Seely, Zuskin, Bouhuys 1971; Rush 1974) and college students (Peters and Ferris 1967) provided early evidence of adverse effects of smoking on young smokers. Large studies of schoolchildren (including preteens) in the United Kingdom showed that symptom rates were increased by smoking. Bewley, Halil, and Snaith (1973) reported that the frequency of cough was increased in boys and girls no older than 11.5 years who reported smoking at least one cigarette per week. Other studies in the United Kingdom and the United States found further evidence of the effects of smoking on symptom frequency in children of similar ages (Bewley and Bland 1976; Charlton 1984; see Table 31 in Chapter 3).

The health effects of smoking among adolescents may be confounded by a history of passive smoking if the parents of an adolescent smoker also smoke. However, in a study of 5,835 secondary schoolchildren in Derbyshire (United Kingdom), students who smoked at least one cigarette per week persisted in having an increased risk for cough and dyspnea even after parental smoking was taken into account (Bland et al. 1978).

Control for other potential confounding or mediating factors varies among the investigations. Residence location, a surrogate for exposure to ambient air pollution, was considered in several of the studies (Bewley, Halil, Snaith 1973; Bewley and Bland 1976), and a study of 20-year-olds (Colley, Douglas, Reid 1973) controlled for socioeconomic status.

Lung Function

Numerous cross-sectional studies of adults have shown that cigarette smokers have a lower level of lung function, as assessed by tests of lung mechanics and gas exchange, than persons who have never smoked (USDHHS 1984; Bates 1989). Longitudinal studies show that smoking speeds the age-related decline of lung function. The most abundant evidence describes changes in lung function as assessed by spirometry, or the measure of the volume of air entering and leaving the lungs. One measure of scientific and clinical interest obtained through spirometry is the forced expiratory volume in one second (FEV_1), the volume of air blown out during the first second of the forced vital capacity maneuver. FEV_1 increases with lung growth and development during childhood, and rises even more steeply with the growth spurt of adolescence (Tager et al. 1988; Sherrill et al. 1992). In persons who have never smoked, FEV_1 begins to decline from a maximum at some time during the third or fourth decades of life (Beck, Doyle, Schachter 1982; Tager et al. 1988). In smokers, the age-related decline commences at a younger age and proceeds at a steeper average rate (Beck, Doyle, Schachter 1982; USDHHS 1984; Tager et al. 1988). When people stop smoking, their average decline gradually returns to the rate observed in those who never smoked (USDHHS 1990).

Cross-sectional and longitudinal data show that smoking also adversely affects lung function in children and adolescents (Table 2). The evidence comes principally from spirometry studies of high school students, although one of the first studies to show reduced lung function in young people involved college seniors (Peters and Ferris 1967). In these studies, impaired lung function has been primarily indicated through reduced flow rates after 50 percent or more of the vital capacity has been exhaled. This effort-independent, latter portion of the flow-volume loop is sensitive to abnormalities of the lung's small airways and the lung parenchyma (Bates 1989). Several studies have also found that smokers have a reduced peak expiratory flow rate (PEFR) (Table 2). This effort-dependent portion of the flow-volume loop is more sensitive to abnormal function of the lung's larger airways than of its small airways (Bates 1989).

Among the first researchers to study smoking among younger people were Peters and Ferris (1967), who obtained spirometric and peak-flow data from 124 Harvard College seniors. Smokers had lower (although not significantly) FEV_1 than persons who had never smoked. Spirometric flow rates and PEFR were significantly lower in the smokers. In an early study involving high school students, Seely, Zuskin, and Bouhuys (1971) found evidence of abnormal function of the small airways in both boys and girls who smoked. Subsequent cross-sectional studies of teenagers have tended to confirm that smokers have reduced lung function, as assessed by spirometry or PEFR measurement.

More recent, longitudinal data show that smoking reduces the rate of lung growth, as would be anticipated

Table 1. Published studies of the effects of smoking on respiratory symptoms among young people, various countries, 1965–1983

Reference[a]	Location/year	Study population
Peters and Ferris 1967	Massachusetts, 1965	124 Harvard College seniors
Holland and Elliott 1968	England, 1965–1966	9,786 13- and 14-year-olds in 1965; 9,433 in 1966
Addington et al. 1970	Oklahoma[b]	557 high school students, (grades 9–12) aged 13–19 years
Seeley, Zuskin, Bouhuys 1971	Connecticut[b]	195 male and 170 female high school students aged 15–19 years
Bewley, Halil, Snaith 1973	England, 1971	8,682 schoolchildren aged 10 and 11 years
Colley, Douglas, Reid 1973	United Kingdom, 1966	3,899 persons aged 20 years sampled from 1946 birth cohort study
Rush 1974	New York, 1968	12,595 high school students aged 13–18 years

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[a] Listed chronologically by publication date.

[b] Year not provided.

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Symptoms	Prevalence (%) by smoking status	
	Never smoker	Smoker[†]
Phlegm ≥ 3 months/yr	2.4	26.5[‡]
Breathlessness	2.4	20.5[‡]
Wheezing (apart from colds)	7.3	31.3[‡]
Colds go to chest	4.9	31.3[‡]

General findings: Increased cough and phlegm in smokers of ≥ 1 cig/week versus never smokers. Dose–response evident. Prevalence of cough and phlegm dropped among smokers who quit smoking between 1965 and 1966.

	Never smoker	Smoker[†]
Daily cough ≥ 3 months	4	10
Daily phlegm ≥ 3 months	3	9
Dyspnea when hurrying	16	30
Chest cold for 1 week	22	30
Wheezing or asthma	12	13

		Number of cigarettes smoked per day			
	0	< 1	1–10	11–20	> 20
Cough	2.0	5.8	18.1	27.8	64.7
Phlegm	3.3	5.8	19.4	31.9	58.8
Shortness of breath	5.3	13.5	13.5	36.1	58.8

	Never smoker	Smoker[§]
Morning cough		
Boys	5.4	18.2
Girls	5.9	19.8
Cough 3 months		
Boys	3.8	15.4
Girls	3.5	12.1

	Never smoker	Ex-smoker	Present smoker
Cough (day or night in winter)			
Boys	5.2	7.1	13.9
Girls	6.5	10.5	16.0

	Nonsmoker	Ex-smoker	Smoker		
			Number of cigarettes smoked per day		
Cough ≥ 3 months/yr[¶]			≤ 1–9	10–14	≥ 15
Boys	2.9	4.5	9.2	16.2	29.0
Girls	4.4	6.0	12.0	23.1	35.9

[†] At least one cigarette daily for the past year.

[‡] $p < 0.01$.

[§] Smoking at least one cigarette weekly. Percentages combine data reported separately in authors' Table 4 for urban and rural children.

[¶] For white children only.

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Table 1. Continued

Reference	Location/year	Study population
Stanhope and Prior 1975	New Zealand, 1972	Maori and European high school students aged 13–15 years
Bewley and Bland 1976	**England, 1971**	**5,355 schoolchildren aged 10–12 years**
Bland et al. 1978	England, 1974	5,835 schoolchildren; first-year level in secondary school
Weiss et al. 1980	**Massachusetts, 1975**	**650 children aged 5–9 years, population sample**
Kujala 1981	Finland, 1976	1,075 male military recruits, mean age = 20 years
Charlton 1984	**England, 1982**	**15,709 students aged 8–19 years**
Adams et al. 1984	England, 1975–1979	405 secondary schoolchildren
Rimpela and Rimpela 1985	**Finland, 1983**	**4,279 16- and 17-year-olds in a national sample**
Oechsli, Seltzer, van den Berg 1987	California, 1977–1979	1,445 children in a cohort study

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[**] Smoking at least one cigarette weekly. Percentages combine data reported separately in authors' Table V for urban and rural children.

[††] RR = Relative risk for children smoking ≥ one cigarette weekly versus children who had never smoked, adjusted for parental smoking.

[‡‡] Smoking at least one cigarette weekly.

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Symptoms	**Prevalence (%) by smoking status**		

General finding: Cough grade, phlegm grade, and loose cough sign significantly associated with smoking.

	Never smoker	**Smoker**[**]	**RR**[††]
Morning cough			
Boys	8.3	16.3	5.9
Girls	8.5	28.6	6.8
Cough 3 months			
Boys	7.2	13.4	2.4
Girls	6.0	10.7	2.6

	Never smoker	**Smoker**[‡‡]	**RR**[§§]
Morning cough			
Boys	3.1	19.2	5.9
Girls	1.8	13.5	6.8
Cough day or night			
Boys	20.4	46.5	2.4
Girls	18.5	47.3	2.6
Breathlessness			
Boys	11.8	34.9	2.9
Girls	16.5	39.2	2.3

General findings: Persistent wheezing reported for 13.8% of ever smokers and 9.7% of never smokers; difference not significant.

	Nonsmoker[‖‖]	**Ex-smoker**[¶¶]	**Smoker**[***]
Cough all day	1	2	8
Phlegm all day	1	1	7
Wheezing	5	13	22

	Number of cigarettes smoked per day		
Frequent cough	**0**	**1–6**	**> 6**
Boys			
Age 11–13	23	32	42
Age ≥ 14	9	16	29
Girls			
Age 11–13	19	34	49
Age ≥ 14	9	18	32

General findings: Increased risk of cough, dyspnea, and phlegm.

	Never smoker	**Low-tar smoker**[†††]	**Medium-tar smoker**[‡‡‡]
Morning phlegm	2.7	7.6	11.4
Morning cough	6.3	20.7	20.5
Phlegm day or night	5.2	13.8	13.2
Cough day or night	19.1	43.9	40.6

General findings: Starting smoking associated with bronchitis and pneumonia.

[§§] RR = Relative risk for children smoking at least one cigarette weekly versus children who had never smoked.

[‖‖] Nonsmoker = Never smoking and smoking not more than one cigarette daily for ≤ one year.

[¶¶] Ex-smoker = Smoking one month or more before date of the interview.

[***] Smoker = Smoking ≥ 1g of tobacco daily; one cigarette was estimated to contain 1g of tobacco.

[†††] Smoking daily, cigarettes < 10mg of tar.

[‡‡‡] Smoking daily, cigarettes 10–18mg of tar.

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Table 2. Published studies of the effects of smoking on lung function among young people, various countries, 1965–1981

Reference*	Location/year	Study population	Findings†	Comment
Peters and Ferris 1967	Massachusetts, 1965	124 Harvard College seniors	Significant reduction in spirometric flow rates when comparing NS with persons smoking a pack a day for four years during college; dose response with amount smoked.	Age distribution not given, nonsignificant reduction for FEV_1.
Addington et al. 1970	**Oklahoma‡**	**140 male and 417 female high school students aged 13–19 years (grades 9–12)**	**No significant difference in VC and FEV_1 when comparing NS with smokers of ≥ 1 cig/day for last year.**	**Age distribution not given; no adjustment for height in analysis of spirometric data.**
Seely, Zuskin, Bouhuys 1971	Connecticut‡	195 male and 170 female high school students aged 15–19 years	From MEFV curves, V_{50} and V_{75} significantly reduced in boys smoking > 15 cigs/day and girls smoking > 10 cigs/day, when compared with NS.	Age distribution not given, nonsignificant reduction for FEV_1.
Lim 1973	**Nebraska‡**	**50 male and 50 female high school students aged 15–18 years**	**No significant difference in FEV_1 and FVC when comparing NS with smokers of ≥ 10 cigs/day for 1 year; 10 of 50 smokers abnormal by partial MEFV curves.**	None
Comstock and Rust 1973	Nationwide, 1970–1971	3,409 U.S. Navy recruits, median age = 19 years	PEFR lower in smokers (99.5% predicted) than in nonsmokers (100.7% predicted).	No definition of smoker, nonsmoker; tests of statistical significance not provided.

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*Listed chronologically by publication date.

†NS = never smoker; FEV_1 = forced expiratory volume in one second; VC = vital capacity; MEFV = maximal expiratory flow volume; V_{50} = flow rate at 50% of vital capacity; V_{75} = flow rate after exhalation of 75% of vital capacity; FVC = forced vital capacity; PEFR = peak expiratory flow rate; FEF_{25-75} = forced expiratory flow from 25% to 75% of FVC.

‡Year not provided.

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Table 2. Continued

Reference	Location/year	Study population	Findings[†]	Comment
Backhouse 1975	United Kingdom[‡]	195 boys at a detention center, mean age = 18 years	PEFR on arrival dropped significantly with daily smoking amount; significant improvement during 8-week stay while unable to smoke	None
Walter, Nancy, Collier 1979	India[‡]	102 male medical students aged 19–21 years	Significantly lower PEFR and spirometric flows when comparing NS with smokers of > 10,000 cigarettes per lifetime.	Values for smokers of ≤ 10,000 cigarettes were between those of nonsmokers and heavy smokers.
Woolcock et al. 1979	Australia, 1971–1980	10,898 school children, mean ages = 8.9 years for primary school and 12.6 years for high school groups	No overall effect of smoking on spirometric values in 1974 data; decreased lung growth in smoking boys who had had bronchitis before age 2 years.	See text for review of longitudinal findings.
Weiss et al. 1980	Massachusetts, 1975	650 children aged 5–9 years, population sample	Smoking not associated with FEF_{25-75}.	Only 58 children reported ever smoking; see text for longitudinal findings.
Kujala 1981	Finland, 1976	1,075 male military recruits, mean age = 20 years	Significantly reduced FEV_1 and spirometric flows when comparing NS with smokers at interview.	None
Spinaci et al. 1985	Italy, 1980–1981	1,266 male and 1,119 female 6th graders, mean age = 11 years	Smoking negatively associated with FEF_{25-75} and V_{50}.	Definition for smoking not given; lung function data not provided.

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from the findings from cross-sectional studies. Beck, Doyle, and Schachter (1982) examined white residents of Lebanon, Connecticut, in 1972 and 1978. Among male and female subjects aged 15 through 24 in 1972, smoking had reduced the increment of FEV_1 during the six-year follow-up interval.

In a 10-year study in Sydney, Australia, Woolcock et al. (1984) periodically measured lung function in an initial cohort of 11,497 schoolchildren. Two groups of children were included: a younger cohort that was 8.9 years of age on average at enrollment and an older cohort aged 12.6 years on average at enrollment. The investigators followed up the cohort annually, measuring respiratory function and assessing symptoms, illnesses, and smoking. A small number of children were studied more intensively with the single-breath nitrogen test. The effect of smoking was examined only in the older cohort. Cross-sectional assessment of these data showed that at 50 percent of vital capacity, smokers tended to have lower maximal expiratory flow than nonsmokers. For example, adolescents who smoked at least 10 cigarettes per week had about a 5 percent lower expiratory flow rate than nonsmokers. The investigators concluded that abnormalities attributable to smoking were found in adolescents as young as age 14 and as soon as one year after beginning to smoke at least 10 cigarettes per week. They also concluded that smoking was more harmful for children and adolescents who had a history of respiratory illness, particularly asthma.

A cohort study of children in East Boston, Massachusetts, has been informative on the effects of passive and active smoking on lung function (Tager et al. 1979, 1983, 1985, 1988). In 1974, the study enrolled a cohort of children aged five through nine who were sampled from schools in East Boston. The families of these children were then invited to participate in the initial survey and in periodic follow-up examinations that included a respiratory questionnaire and spirometry.

Several relevant longitudinal analyses of the East Boston data have been reported (Tager et al. 1985, 1987, 1988). Using data from the first seven follow-up examinations, Tager et al. (1985) described the effect of smoking on the growth rates of FEV_1 and on forced expiratory flow (FEF) from 25 to 75 percent of forced vital capacity (FEF_{25-75}) in a group of 669 subjects aged 5 through 19 years at enrollment. Using a Markov-type autoregressive model, researchers found significant effects of smoking on both measures of lung function. The model predicted that a child's smoking, beginning at age 15 and continuing through age 20, would reduce FEV_1 to 92 percent of the expected value and FEF_{25-75} to 90 percent of the expected value. A subsequent analysis using a nonparametric curve-smoothing method on these same data showed that male smokers had a smaller increase of FEV_1 at the end of the growth phase (a suggestion of a lower maximum lung function) than males who had not smoked; those who continued to smoke into early adulthood also showed no evidence of the plateau observed in never smokers before lung function began to decline. Similar findings were reported for females.

Relevant information is also available from a community population study in Tucson, Arizona (Lebowitz and Holberg 1988). The Tucson cohort was derived from a population sample of 325 non-Hispanic white residents, originally sampled in 1972 when they were an average age of 8.8 years. Like the East Boston study, the Tucson study was directed primarily at passive smoking but also gathered information on active smoking by measuring FEV_1 and FEF_{25-75}. The Tucson study found effects of comparable magnitude with those observed in the East Boston study. Although these effects did not reach statistical significance in the Tucson data, they were in the same direction as those from East Boston, and the sample population was only half the size.

Sherrill et al. (1992) examined the longitudinal effects of active and passive smoking on lung function in a cohort of New Zealand children observed from ages 9 through 15. Active smoking did not have statistically significant effects on FEV_1, vital capacity, or FEV_1/vital capacity (percent), but the numbers of regular smokers were small. By age 15, 43 percent reported occasional smoking (during the last year but not every day), but only 10 percent were daily smokers (smoking any number of cigarettes on a daily basis).

Jaakkola et al. (1991) carried out an eight-year longitudinal study of lung function in a cohort of young adults aged 15 through 40 at enrollment. Of 1,044 enrolled, 391 were subsequently followed. Smoking was found to have a significant effect on change in FEV_1 during the study period, but the results were not reported by age interval.

Respiratory Morbidity

In adults, smoking is associated with increased morbidity, as indexed by such measures as use of outpatient medical services and absenteeism from work, and with increased respiratory morbidity, as indexed by frequency or severity of respiratory infections (USDHHS 1990). Because smoking has been shown to alter immune and inflammatory responses (U.S. Department of Health, Education, and Welfare [USDHEW] 1979b), these effects on an individual's defenses could plausibly lead to increased frequency and severity of respiratory infections in smokers.

Studies involving a wide age range of young people indicate that smoking increases respiratory morbidity (Table 3). A number of these studies compared medical care by smokers and nonsmokers in settings where all medical care was obtained at a single clinic. In one of the earliest studies, Haynes, Krstulovic, and Bell (1966) examined the numbers of diagnoses for respiratory tract illnesses among male students (aged 14–19 years) at a preparatory school. Nearly half of the students were smokers. All respiratory illnesses were more common in the smokers; the increase was greatest for the illnesses considered "severe." The findings of studies involving student nurses (Parnell, Anderson, Kinnis 1966) and military cadets (Finklea et al. 1971) were similar.

A series of studies have included military recruits as subjects (Table 3); their ages ranged from 18 through 22. In the study of Pollard et al. (1975), the rates of respiratory diagnoses were not significantly different between smokers and nonsmokers. In the more recent study of military recruits by Blake, Abell, and Stanley (1988), self-report of smoking was associated with increased risk for diagnosis of an upper respiratory tract infection during a 13-week basic training period. Kark and Lebiush (1981) and Kark, Lebiush, and Rannon (1982) examined attack rates for influenza and influenza-like illnesses in Israeli military recruits and found that smoking was associated with an increased attack rate in both male and female recruits.

Recently, in a study that examined adolescents and young adults who had sickle cell anemia, Young et al. (1992) found a strong relationship between cigarette smoking and acute chest syndrome. In sickle cell anemia patients, acute chest syndrome is characterized by fever, cough, chest pain, leukocytosis, and pulmonary infiltrates in the chest radiograph. All smokers in this study had a history of acute chest syndrome, whereas 65 percent of the nonsmokers did. Smoking also appeared to increase the frequency of sequelae of sickle cell lung disease.

A study in the United Kingdom (Charlton and Blair 1989) associated smoking with increased absenteeism from school among 2,885 children aged 12 and 13 years. Children who on an initial questionnaire reported regular smoking were more likely than nonsmokers to be absent when a follow-up questionnaire was administered four months later. The authors interpreted these findings as showing a higher rate of minor ailments in children who smoked; however, the design could not exclude other plausible explanations (such as truancy) for the difference. In a survey of adolescents invited for an overall evaluation in three general practices in the United Kingdom, smokers reported a higher prevalence of health problems than nonsmokers (25 percent vs. 16 percent, p = .06) (Townsend et al. 1991).

Epidemiologic Evidence of Nonrespiratory Effects

Cardiovascular Disease

In adults, cigarette smoking is a cause of coronary heart disease, arteriosclerotic peripheral vascular disease, and stroke (USDHHS 1989). Although these diseases rarely occur in children and adolescents, autopsy studies of young male victims of combat during the Korean and Vietnam conflicts and community-based autopsy studies of adolescents and young adults have shown that atherosclerosis begins in childhood and may become clinically significant in young adulthood (McNamara et al. 1971; Enos, Holmes, Beyer 1986; Strong 1986).

Several autopsy-study series link cigarette smoking to the occurrence and extent of atherosclerosis in young adults. Strong and Richards (1976) described the association of cigarette smoking with atherosclerosis in 1,320 men from the New Orleans area. In the youngest group (aged 25 to 34 years), the development of atherosclerosis in the coronary arteries and the abdominal aorta was consistently greater with higher levels of smoking.

More recently, an eight-community study by the Pathobiological Determinants of Atherosclerosis in Youth (PDAY) Research Group (1990) found associations of smoking with atherosclerosis in 390 males aged 15 through 34 years who died of violent causes (e.g., accidents, homicides, suicides). In this study, lipids were measured in postmortem serum, and smoking was assessed by the level of serum thiocyanate. After controlling for lipid levels, age, and race, a multiple regression analysis revealed a significant association between smoking and atherosclerosis (i.e., having raised lesions greater than or equal to 5 percent of the intimal surface area) in the abdominal aorta. A multiple logistic analysis controlling for the same factors found that smoking was a significant predictor of atherosclerosis in both the abdominal aorta and the right coronary artery.

The Bogalusa Heart Study is an epidemiologic study of cardiovascular disease risk factors encountered from birth through age 26. Among deceased subjects whose average age was 18 years, cigarette smoking was not associated with aortic fatty streaks or involvement of the coronary arteries with atherosclerosis (Newman et al. 1986; Freedman et al. 1988). However, in subjects who

Table 3. Published studies of the effects of smoking on respiratory morbidity among young people, various countries, 1963–1987

Reference[*]	Location/year	Study population
Haynes, Krstulovic, Bell 1966	New Jersey[†]	191 male prep school students aged 14–19 years
Parnell, Anderson, Kinnis 1966	Canada, 1963–1964	175 senior student nurses
Finklea et al. 1971	South Carolina, 1968–1969	1,900 college students
Pollard et al. 1975	Florida, 1971–1972	1,100 U.S. Navy recruits, most aged 18–22 years
Kark and Lebiush 1981	Israel, 1979	Female military recruits, mean age = 18.5 years
Kark, Lebiush, Rannon 1982	Israel, 1978	Male military recruits, mean age = 18.5 years
Blake, Abell, Stanley 1988	Georgia, 1982	1,230 Army recruits, most aged < 22 years
Charlton and Blair 1989	England, 1987	2,885 schoolchildren aged 12 and 13 years
Schwartz and Zeger 1990	California[†]	100 student nurses

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[*] Listed chronologically by publication date.

[†] Year not provided.

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Health effect	Prevalence (%) by smoking status			
	Nonsmoker	Occasional smoker[‡]		Regular smoker[§]
Annual illness rates[‖] / 10 students				
All respiratory	11.0	16.0		22.0
Severe respiratory	1.4	3.6		5.4
	Nonsmoker			**Smoker**
Illness incidence[¶] (per 1,000 days)				
All respiratory	6.6			10.6
Upper respiratory	5.2			7.5
Lower respiratory	1.4			3.2
	Number of cigarettes smoked per day			
	0	**≤ 1 pack**		**> 1 pack**
Incidence rate[**] (per 100 school years)				
Upper respiratory				
Outpatient	52.5	59.9		67.0
Hospital	7.6	12.0		10.2
Lower respiratory				
Outpatient	2.5	3.0		6.8
Hospital	0.4	0.7		0.9
	Number of cigarettes smoked per day			
	0	**< 10**	**10–19**	**≥ 20**
Rate of outpatient visits[††] for respiratory episodes (per 1,000 recruits)				
Febrile	249	256	257	222
Afebrile	436	469	562	560
	Occasional/regular smoker[§§]			**Never/past smoker**
Attack of influenza-like morbidity[‡‡]	60%			40%
	Number of cigarettes smoked per day			
	0	**≤ 10**	**11–20**	**> 20**
Influenza morbidity[‖‖] during an outbreak				
Affected	47.2	62.9	67.7	71.8
Severe cases	30.1	42.9	51.6	53.5

General Findings: Relative risk = 1.46 for upper respiratory infection for smokers versus nonsmokers. Illnesses ascertained by visits to clinics.

General Findings: Smoking associated with increased absence from school: odds ratio = 1.29 for sometimes smokers and 3.09 for regular smokers (compared with never smokers).[††]

General Findings: Smoking significantly associated with incidence of cough and phlegm. Current amount smoked significantly predicted duration of an episode of phlegm or chest discomfort.

[‡] Smoked at least 1 cigarette or pipe per week.

[§] Smoked at least 1 cigarette or pipe per day.

[‖] Illness rates based on infirmary visits during a school year.

[¶] Illness incidence based on records of the health service.

[**] Incidence rates based on self-administered questionnaire.

[††] Respiratory-related (similar symptoms) visits to dispensary, with one week grouped.

[‡‡] Based on self-administered questionnaire.

[§§] These categories were not defined.

[‖‖] Illness occurrence based on medical records and serology.

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died after age 20, smoking appears to have been related to atherosclerosis (Berenson et al. 1992).

Smoking among young people has been associated with serum lipid profiles in a pattern predictive of increased risk for cardiovascular diseases. In a published meta-analysis of studies on children who smoke, Craig et al. (1990) found that among 8- through 19-year-olds, smoking increased levels of low-density lipoprotein cholesterol by 4 percent, triglycerides by 12 percent, and very-low-density lipoprotein cholesterol by 12 percent. Levels of high-density lipoprotein (HDL) cholesterol were reduced by 9 percent. These changes were comparable to—and of larger magnitude than—those observed in smoking adults.

Physical Fitness

Even among young people trained as endurance runners, smoking appears to compromise physical fitness in levels of both performance and endurance. Cigarette smoking reduces the oxygen-carrying capacity of the blood and increases both heart rate and basal metabolic rate—changes that counter the benefits of physical activity in a direct relation to the duration of smoking and the number of cigarettes regularly smoked (Royal College of Physicians of London 1992). In a study of 19-year-old army conscripts (N = 6,500), those who smoked ran a significantly shorter distance in 12 minutes and took significantly longer to sprint 80 meters than their nonsmoking counterparts (Marti et al. 1988). In the same study, the smokers among 4,100 joggers in a 16-kilometer race were consistently slower than the nonsmokers.

Young adult smokers also have chronic, mild adverse cardiovascular physiologic changes, including diminished exercise performance on standard treadmill testing and blunted heart rate response to exercise (Sidney et al. 1993). The left ventricular mass is increased in young adult smokers, and their resting heart rates are two to three beats per minute more rapid than nonsmokers' (Gidding et al. 1992).

Health Outcomes in Pregnancy

Cigarette smoking during pregnancy has been linked with a variety of adverse outcomes (USDHHS 1989, 1990). Early reports of the Surgeon General (USDHEW 1971, 1973, 1979a) concluded that smoking by a mother during pregnancy retards fetal growth and may cause fetal death late in pregnancy as well as infant mortality. The 1977–1978 report (USDHEW 1979a) further concluded that smoking during pregnancy has dose–response relationships with abruptio placenta, placenta previa, bleeding during pregnancy, premature and prolonged rupture of placental membranes, and preterm delivery. The comprehensive reviews of the 1979 and 1980 reports (USDHEW 1979a; USDHHS 1980) concluded that the risk of spontaneous abortion increases with the amount of smoking and that the risk of sudden infant death syndrome (SIDS) is increased by maternal smoking. A more recent study confirms the increased risk of SIDS with maternal smoking (Schoendorf and Kiely 1992). Impaired fertility was linked to smoking in the 1980 report (USDHHS 1980). These adverse health effects of smoking on reproduction have not been specifically investigated in young women in the 10- through 20-year age range.

Epidemiologic Evidence of the Health Effects of Passive Smoking

The health effects of passive smoking were comprehensively addressed in the 1986 report of the Surgeon General (USDHHS 1986a) and in a report of the National Research Council (1986). These reviews and subsequent reports (Samet, Cain, Leaderer 1991; USEPA 1992) have demonstrated that exposure to parental smoking during childhood significantly increases the occurrence of lower respiratory illnesses during the first years of life, increases the frequency of chronic respiratory symptoms, and reduces the rate of lung growth during childhood and adolescence. Evidence is accumulating to suggest that smoking by parents increases the severity of childhood asthma (USDHHS 1991b; Samet, Cain, Leaderer 1991), as indicated by the need for medication and hospital treatment. SIDS, the most common cause of death in the first year of life, has been linked to parental smoking in several epidemiologic studies. Children of parents who smoke have a twofold increased risk of dying of SIDS; this relationship appears to be dose-related (Schoendorf and Kiely 1992; Malloy et al. 1988).

The evidence on passive smoking and respiratory health was recently reviewed by the USEPA (1992). This review confirmed that ETS is causally linked to lung cancer. Janerich et al. (1990) noted that approximately 17 percent of lung cancers among nonsmokers can be attributed to high levels of ETS during childhood and adolescence. The USEPA report also concluded that exposure to ETS causes lower respiratory illness in infants and young children; this finding is stronger than that of the 1986 Surgeon General's report, which did not characterize this association as causal. The agency's report also inferred from its data that childhood exposure to ETS reduced lung function, increased respiratory symptoms, caused middle ear effusion, and exacerbated asthma. For example, the report estimated that ETS exposure exacerbates symptoms of asthma in about 20 percent of the two million to five million asthmatic children in the United States. The report also hypothesized that ETS may be associated with the onset of asthma.

Many chronic changes in cardiovascular physiology have been observed in children exposed to ETS. These changes include lower HDL cholesterol, increased carboxyhemoglobin concentration, and increased red-cell 2,3-diphosphoglycerate, as well as physiologic response suggesting mild, chronic hypoxemia (Moskowitz et al. 1990). ETS is also known to increase platelet aggregation (Glantz and Parmley 1991).

The effect of peer smoking—as a source of ETS—on nonsmoking children has not been studied but may also be a health risk.

Adult Health Implications of Smoking Among Young People

Respiratory Diseases

As was discussed previously, sustained smoking during adulthood is associated with the development of COPD and the progressive loss of lung function (USDHHS 1984, 1990). Evidence suggests that smoking during childhood may increase the risk for developing COPD in adulthood as well as at an earlier age. The adult who smoked during childhood may have experienced early inflammatory changes—childhood smoking is known to reduce lung growth—and thereby not attained the level of function achieved during the normal growth and development of the lungs. Any age-related decline in lung function during adulthood would thus start from a lower level—and might begin at a younger age—than declines observed in adults who have never smoked. In fact, the proportionate impeding effect of childhood smoking on lung growth greatly exceeds the loss of lung function associated with smoking during adulthood (Tager et al. 1985, 1988).

If one or both parents of an adolescent smoke, the effects of parental smoking on early childhood respiratory illnesses and on the growth of lung function may increase the risk of COPD. Illnesses in the lower respiratory region during childhood are a suspected risk factor for COPD (Samet, Tager, Speizer 1983), and passive smoking reduces the rate at which lung function grows (USDHHS 1986a).

Cardiovascular Disease

In adults, cigarette smoking has been causally associated with coronary heart disease, arteriosclerotic peripheral vascular disease, and stroke (USDHHS 1983, 1989). Smoking contributes to increased risk for coronary heart disease probably through at least five interrelated processes, including the development of atherosclerosis (USDHHS 1990). It is likely that the earlier the age at which one starts to smoke, the earlier the onset of coronary heart disease. The recent evidence from the PDAY Research Group shows more atherosclerosis in young smokers than in young nonsmokers. The unfavorable effects of smoking on lipid levels in children may contribute to the development of atherosclerosis in young adulthood.

Cancer

The multistage concept of carcinogenesis implies that the risk of smoking-related cancers is strongly dependent on the duration and intensity of smoking (Armitage and Doll 1954; Doll 1971; Taioli and Wynder 1991). The relevant epidemiologic data and mathematical analyses are most abundant for lung cancer. Both epidemiologic and experimental evidence suggest that the risk for lung cancer varies more strongly with the duration of cigarette smoking than with the number of cigarettes smoked (Peto 1977; Doll and Peto 1978). Analysis of data from a cohort study of British doctors showed that lung cancer incidence increased with the fourth or fifth power of duration of smoking but with the second power of number of cigarettes smoked daily (Doll and Peto 1978). Although these data can be adequately described by alternative mathematical models that give lesser weight to duration (Moolgavkar, Dewanji, Luebeck 1989), the dependence of lung cancer risk on duration of smoking implies that starting smoking at an earlier age increases the potential number of life-years of smoking and therefore increases lung cancer risk. If one assumes, for example, that lung cancer risk rises exponentially as a function of the duration of smoking, then the risk at age 50 for a person who began smoking regularly at age 13 is 350 percent greater than that for a 50-year-old who started smoking at age 23.

Similar analyses have not been done for other smoking-related sites of cancer. Nevertheless, for most smoking-related cancers, the risk rises with the duration of smoking (USDHHS 1982, 1989, 1990; International Agency for Research on Cancer 1985). One could infer that the risk of smoking-related cancer for sites other than the lungs would increase, at a given adult age, in inverse proportion to the age an adolescent begins smoking.

Recent studies indicate that earlier onset of cigarette smoking is also associated with heavier smoking (Taioli and Wynder 1991; Escobedo et al. 1993). Heavier smokers are not only more likely to experience tobacco-related health problems, they are the least likely to quit smoking (Hall and Terezhalmy 1984; USDHHS 1989). Early use of cigarettes thus appears to influence intensity as well as duration of use and increases the potential for long-term health consequences.

Nicotine Addiction in Adolescence

Introduction

Nicotine dependency through cigarette smoking is not only the most common form of drug addiction but the one that causes more death and disease than all other addictions combined (USDHHS 1988). Most human research on nicotine addiction has been conducted with adult subjects, but the basic biologic processes that underlie this dependency appear to be similar in adolescents and adults. The research literature on nicotine addiction examines its chemistry and addiction potential, its severity, and its pathophysiology and clinical course.

Background and Nomenclature

Drug addiction is the term most widely used to label various medical and social disorders related to the compulsive ingestion of psychoactive chemicals. The primary criteria for drug dependence are that the behavior is highly controlled or compulsive, the chemical is one whose mood-altering or psychoactive effects are central elements of the drug's activity, and the drug itself has the demonstrated capability of reinforcing behavior (Table 4). The American Psychiatric Association (APA) has identified two medical disorders that pertain to nicotine addiction: nicotine dependence and nicotine withdrawal (APA 1987).

Nicotine dependence is classified as a psychoactive substance-use disorder characterized by "a cluster of cognitive, behavioral, and physiologic symptoms that indicate that the person has impaired control of psychoactive substance use and continues use of the substance despite adverse consequences" (APA 1987, p. 166). In the case of nicotine, the most common form of use is cigarette smoking, in part because the rapid absorption of nicotine through the processes of smoking "leads to a more intensive habit pattern that is more difficult to give up" than other forms of use (APA 1987, p. 181). Nicotine dependence also occurs through other routes of delivery, including smokeless tobacco and nicotine gum.

Nicotine withdrawal, an organic mental disorder induced by the removal of psychoactive substance, is described as "a characteristic withdrawal syndrome due to the abrupt cessation of or reduction in the use of nicotine-containing substances (e.g., cigarettes, cigars and pipes, chewing tobacco, or nicotine gum) that has been at least moderate in duration and amount. The syndrome includes craving for nicotine; irritability, frustration, or anger; anxiety; difficulty concentrating; restlessness; decreased heart rate; and increased appetite or weight gain" (APA 1987, p. 150).

Physical dependence refers to the condition in which withdrawal symptoms have been observed. Physical dependence can complicate the process of achieving and

Table 4. Criteria for drug dependence

Primary criteria

- Highly controlled or compulsive use
- Psychoactive effects
- Drug-reinforced behavior

Additional criteria

Addictive behavior often involves the following:
- Stereotypic patterns of use
- Use despite harmful effects
- Relapse following abstinence
- Recurrent drug cravings

Dependence-producing drugs often manifest the following:
- Tolerance
- Physical dependence
- Pleasant (euphoric) effects

Source: Adapted from USDHHS (1988).

maintaining drug abstinence, and the symptoms can be so unpleasant as to precipitate relapse (Jaffe 1985; USDHHS 1988). In surveys by the National Institute on Drug Abuse (NIDA), withdrawal and inability to maintain abstinence are commonly attributed to cigarette smoking and heroin use (USDHHS 1988). The majority of people monitored who regularly use other addictive drugs (including cocaine and marijuana) report that they have not experienced withdrawal, even though many of these people feel dependent and have been unable to maintain abstinence (USDHHS 1988).

Severity of Nicotine Addiction

Tobacco-delivered nicotine can be highly addictive. Each year, nearly 20 million people try to quit smoking in the United States (USDHHS 1990), but only about 3 percent have long-term success (Pierce et al. 1989; Centers for Disease Control and Prevention [CDC], Office on Smoking and Health, unpublished data). Even among addicted persons who have lost a lung because of cancer or have undergone major cardiovascular surgery, only about 50 percent maintain abstinence for more than a few weeks (West and Evans 1986; USDHHS 1988). In a 1991 Gallup Poll, 70 percent of current smokers reported that they considered themselves to be "addicted" to cigarettes (Gallup Organization 1991). These findings are consistent with data from NIDA's 1985 National Household Survey on Drug Abuse (NHSDA), which showed that 84 percent of 12- through 17-year-olds who smoked one pack or more of cigarettes per day felt that they "needed" or were "dependent" on cigarettes (Henningfield, Clayton, Pollin 1990). The NHSDA data show that young smokers develop tolerance and dependence, increase the amount they smoke, and are unable to abstain from nicotine. These findings suggest that the addictive processes in adolescents are fundamentally the same as those studied in adults (USDHHS 1988; Henningfield, Clayton, Pollin 1990).

Several studies have found nicotine to be as addictive as heroin, cocaine, or alcohol (Henningfield, Clayton, Pollin 1990; Henningfield, Cohen, Slade 1991; Kozlowski et al. 1993). Moreover, because the typical pattern of tobacco use entails daily and repeated doses of nicotine, addiction is more common among all users than is true of other drug use, which tends to occur on a far less frequent basis (USDHHS 1988). For example, only about 10 to 15 percent of current alcohol drinkers are considered problem drinkers, but approximately 85 to 90 percent of cigarette smokers smoke at least five cigarettes every day (Henningfield, Cohen, Slade 1991; Evans et al. 1992; Henningfield 1992b; Kozlowski et al. 1993). Only 2 to 3 percent of smokers (or about 7 to 10 percent of those who try quitting) stop smoking for one year (CDC 1993a), and most daily smokers report that they feel dependent on smoking and have experienced withdrawal symptoms (USDHHS 1988; Henningfield, Clayton, Pollin 1990).

Chemistry and Addiction Potential

Many behaviors that become regular, habitual, and hard to give up involve the ingestion of a substance. What sets drug addictions apart from less harmful habits is that the ingested substance releases a psychoactive drug with the demonstrated potential to addict. Several thousand chemicals are present in cigarette smoke. Some may conceivably modulate nicotine's addictive effects, but the fact that different forms of nicotine delivery can be substituted for one another (e.g., nicotine gum or transdermal patch in place of cigarettes) suggests that nicotine is critical in the addiction process (Henningfield 1984; Benowitz 1988; USDHHS 1988; Russell 1990).

Nicotine is a naturally occurring alkaloid present in varying concentrations in different strains of tobacco. Most cigarettes sold in the United States contain about 8 to 9 milligrams of nicotine, of which the smoker typically ingests 1 to 2 milligrams per cigarette (Benowitz et al. 1983; USDHHS 1988). Nicotine is both a lipid- and water-soluble molecule that can be rapidly absorbed in a mildly alkaline environment through the skin or the lining of the mouth and nose. Because of the massive area for absorption in the alveoli of the lungs, nicotine inhaled deeply is almost immediately extracted from the smoke into the pulmonary veins; this sudden spike or bolus of nicotine is delivered to the brain, via arterial circulation, in approximately 10 seconds (USDHHS 1988). In contrast, although smokeless tobacco has much higher levels of nicotine than cigarettes, the delivery of the drug is much more gradual; the effect peaks within approximately 20 minutes of use (Benowitz et al. 1988). The peak for nicotine replacement medications is even slower—30 minutes or longer for nicotine gum (Benowitz et al. 1988), several hours for the four commercially available transdermal patch systems (Palmer, Bucklet, Faulds 1992). In fact, because of the efficiency of the pulmonary route in extracting nicotine from inhaled tobacco smoke, nicotine may be 10 times more concentrated in arterial blood than in simultaneously sampled venous blood; these levels are much higher than those produced by nicotine replacement medications (Henningfield, London, Benowitz 1990).

As vehicles for nicotine delivery, tobacco products are convenient to use, and they provide the experienced user with a means of regulating dose level. Such control does not, however, protect the user against drug dependency, since tobacco products appear to deliver the optimal addiction potential (or abuse liability) of nicotine. Chemicals can be tested for their addiction potential to determine if they are psychoactive and if they can serve as reinforcers in animals and humans (Brady and Lukas 1984; USDHHS 1988; Fischman and Mello 1989; Henningfield, Cohen, Heishman 1991). These methods to test for abuse liability are reliable enough for the Food and Drug Administration (FDA) and the World Health Organization (WHO) to use them to develop policies regarding regulation of new drugs with possible addiction potential (USDHHS 1988; Barcelona Conference 1991). Nicotine meets the criteria for addiction potential in all of the standardized tests used by the FDA and the WHO (USDHHS 1987, 1988, 1991a). In humans and animals, nicotine produces discrete subjective effects more similar to those produced by cocaine than to those produced by sedatives, and nicotine injections are biologically reinforcing to humans and to at least five animal species (Henningfield, Miyasato, Jasinski 1985; Henningfield and Goldberg 1988; USDHHS 1988). Such findings confirm the conclusion of the 1988 report of the Surgeon General: nicotine is a drug with a liability for addiction (USDHHS 1988).

Pathophysiology of Nicotine Dependence

The pathophysiology of drug dependence and the clinical course of nicotine and other drug dependencies have been described in detail elsewhere (Jaffe 1985; USDHHS 1988; Benowitz 1992; Henningfield 1992a). In brief, exposure to a psychoactive chemical leads to repetitive self-administration because of the chemical's capacity to condition behavior. This powerful conditioning action of nicotine is mediated at least in part by the activation of nicotinic receptors in the brain (USDHHS 1988; Bock and Marsh 1990) and the modulation of levels of hormones such as epinephrine (adrenaline) and cortisol (Pomerleau and Pomerleau 1984; Sachs 1987; USDHHS 1988). The mesolimbic dopaminergic reward system, which mediates the addicting actions of cocaine, is also thought to be involved in producing nicotine's addictive effects (Pomerleau and Pomerleau 1984; USDHHS 1988; Bock and Marsh 1990; Balfour 1991a, b; Benwell and Balfour 1992). Behaviors that are followed by intense neural activation can become highly persistent and difficult to modify (Pomerleau and Pomerleau 1984; Jaffe 1985; USDHHS 1988). Each year, the daily cigarette smoker may experience 50,000 to 100,000 such pairings of puffing on cigarettes and resultant effects in the brain, thus establishing a persistent need for cigarette smoking.

Tolerance

Tolerance refers to a diminishing response to a drug through repeated exposures (Jaffe 1985; USDHHS 1988). Tolerance is often demonstrated when increased dose levels are required to obtain the effects formerly produced by lower doses. Tolerance to nicotine appears to be acquired as people progress from initially smoking a few cigarettes to smoking greater numbers of cigarettes more often (see "Initiation Continuum of Smoking" and "Adult Implications of Adolescent Smoking" in Chapter 3 and "Developmental Stages of Smoking" in Chapter 4). The development of tolerance to the aversive effects of nicotine, such as nausea and dizziness, may also facilitate the development of dependency (USDHHS 1987; Shiffman et al. 1990; Shiffman 1989, 1991; McNeill, Jarvis, West 1987). Tolerance of nicotine increases over time; experienced smokers can self-administer doses of nicotine that would make nonsmokers ill.

The tolerance the nervous system develops to nicotine exposure can be at least partially overcome by increasing the dose. This effect was studied near the beginning of the 20th century and has been the subject of considerable study since then (Langley 1905; USDHHS 1988; Benowitz and Jacob 1993). Tolerance to various behavioral, physiologic, and subjective effects of nicotine has been studied (USDHHS 1988). For example, administering nicotine to a tobacco-deprived cigarette smoker can produce a substantial increase in heart rate and measures of euphoria, along with a decrease in the strength of the knee reflex. With repeated doses, the heart rate stabilizes at a level between that produced by the first dose and that which occurs when nicotine-deprived; subjective effects are minimal, and the knee reflex may become normal (Domino and Von Baumgarten 1969; USDHHS 1988; Swedberg, Henningfield, Goldberg 1990).

Some tolerance of nicotine is lost each night as the smoker's nicotine levels fall; the nicotine from the first few cigarettes of the day produces effects on heart rate, mood, and other measures that are stronger than the effects produced by subsequent doses during the day (USDHHS 1988). Repeated exposure to nicotine leads to morphological changes in the brain that cause the development of new binding sites for nicotine receptors, which mediate the effects of nicotine (Bock and Marsh 1990; USDHHS 1988, 1991a).

Animal research has shown that nicotine exposure results in an increased expression (defined as up-regulation) of nicotine receptors in various regions of the brain (Ksir et al. 1985; Morrow, Loy, Creese 1985; Nordberg et al. 1985; Schwartz and Kellar 1985; Ksir, Hakan, Kellar 1987). Prenatal exposure to nicotine also produces up-regulation of nicotine receptors in tissue collected from newborn animals (Slotkin, Orband-Miller, Queen 1987; Slotkin et al. 1991; Smith, Seidler, Slotkin 1991). These data suggest the broad applicability of this up-regulation effect, which may be one of the ways in which tolerance of nicotine occurs (USDHHS 1989).

Human research is more limited than animal research in this area, but there is evidence that cigarette smoking is associated with up-regulation of nicotine receptors in the human brain. Balfour (1989, 1991a) has conducted a series of studies that included the examination of postmortem brain tissue from smokers and nonsmokers. He and others found evidence of significantly elevated concentrations of nicotine binding sites as well as smoking-related changes in other binding sites (such as 5-hydroxytryptamine) (Benwell, Balfour, Anderson 1988; Balfour 1989, 1991a; Grant, McMurdo, Balfour 1989; Bock and Marsh 1990). Morphologic changes in the nervous system are presumed to reflect part of the body's adaptation (resulting in tolerance and physical dependence) to a prolonged exposure to nicotine (Marks and Collins 1982; Marks, Burch, Collins 1983; Marks et al. 1985, 1986; Marks, Stitzel, Collins 1985, 1986, 1987; USDHHS 1988).

Physical Dependence

Nicotine administered to animals and humans produces altered spontaneous electroencephalograph (EEG) and evoked electrical potentials of the brain, altered local cerebral glucose metabolism, modulation of hormonal output by the adrenal glands, increased heart rate, and changes in skeletal muscle tension (USDHHS 1988). Most, if not all, of these effects are related to the dose of nicotine given, and tolerance develops to differing degrees across these effects. After a period of nicotine exposure that is assumed to be at least several weeks (APA 1987), physical dependence on nicotine develops. The dependent person then appears to be functioning normally when under the influence of nicotine; conversely, the person may report feeling "abnormal" or "not right" when deprived for more than a few hours (Casey 1987).

Although basic pharmacologic research on nicotine has been conducted primarily with adults, most people begin to smoke in adolescence and develop characteristic patterns of nicotine dependence before adulthood (USDHHS 1988, 1991a). That adolescents develop physical dependence, as evidenced by their experience of withdrawal symptoms, has been well documented by the NHSDA (USDHHS 1991c). Moreover, quantitative characteristics of the withdrawal syndrome appear to be the same in adolescents and adults (McNeill et al. 1986; McNeill, Jarvis, West 1987).

The magnitude of the withdrawal syndrome is related to the previous level of nicotine intake, although differences in just a few cigarettes a day may not be correlated with the severity of the syndrome (Killen et al. 1988; USDHHS 1988). Environmental context is also a factor; in a novel environment (e.g., a hospital setting), the symptoms of nicotine withdrawal may be less than in the smoker's usual environment, with its various psychological cues for smoking (Hatsukami, Hughes, Pickens 1985). The time course of withdrawal symptoms varies among individuals and for different responses. Most withdrawal symptoms peak within the first few days of nicotine abstinence and then begin to recover along a variable course; the most severe total withdrawal syndrome usually lasts about three to four weeks (USDHHS 1988; Gross and Stitzer 1989). For example, certain measures of brain function (such as P300-evoked electrical potential) recover within a few days, but others may take weeks or more (such as N100-evoked potential, hunger, and craving). Powerful urges to smoke may recur for many years (Hughes and Hatsukami 1986; USDHHS 1988).

Although questions remain, the pathophysiology of nicotine dependence clearly involves the brain, the endocrine system, and behavior, and the process begins when cigarette smoking is initiated. Moreover, although the effects of nicotine administration and deprivation are complex, they are orderly and are related to factors such as the amount of nicotine administered and the time since the last dose.

The Clinical Course of Nicotine Dependence

Like other drug addictions, nicotine dependence is a progressive, chronic, relapsing disorder. The level of dependence on nicotine in adults has been found to be inversely related to the age at initiation of smoking when measured by diagnostic criteria (APA 1987) of the APA (Breslau, Fenn, Peterson 1993) and by the Fagerström Tolerance Questionnaire Score (Henningfield et al. 1987).

As is true for most drug addictions, tobacco use is not always constant from initiation on; the process of graduation from first use to addiction can take months or even years (USDHHS 1988). In fact, initial experiences with tobacco, as with other addictive substances, are sometimes negative and require social pressures and other factors to maintain exposure until the addiction develops (Haertzen, Kocher, Miyasato 1983). The percentage of people who progress from smoking a few cigarettes to smoking at a regular, addictive level has been estimated to range from 33 to 94 percent. For example, Russell (1990) has reported that a survey of adults in Great Britain in the mid-1960s indicated that 94 percent of those who smoked more than three cigarettes became "long-term regular smokers." These data, which precede widespread public awareness of the hazards of smoking, may have a limited applicability to current smoking behavior. Recently collected data in the United States and Great Britain suggest that between 33 and 50 percent of people who try smoking cigarettes escalate to regular patterns of use (Hirschman, Leventhal, Glynn 1984; McNeill 1991; Henningfield, Cohen, Slade 1991).

The chronic phase of the addictive process is highly resistant to substantial modification. For example, efforts to reduce tobacco smoke and nicotine exposure by smoking cigarettes with lower ratings of nicotine delivery or to smoke fewer cigarettes are usually partially or completely thwarted by compensatory changes in how the cigarettes are smoked; smokers may compensate for "cutting back" by inhaling more deeply or smoking the cigarette farther down to its more potent and more toxic end (Kozlowski 1981, 1982; Benowitz et al. 1983; Benowitz and Jacob 1984; USDHHS 1988). Abstinence from smoking is generally short-lived; the majority of persons who quit on their own or in minimally supportive interventions appear to relapse within one week of their last cigarette (Kottke et al. 1989). In fact, in testament to the persistence of addiction, nearly one-third of those who have abstained for one year after quitting relapse later (USDHHS 1990; Giovino 1991). These patterns of relapse are similar to those observed with other drug addictions.

Several potential predictive measures of the severity of addiction in a person may forecast the severity of withdrawal and the outcome of an attempt to quit. These measures, which have been discussed in detail in the 1988 report of the Surgeon General (USDHHS 1988), include cotinine level in biological fluid such as saliva, blood, or urine; number of cigarettes smoked per day; score on the Fagerström Tolerance Questionnaire; and number of symptoms attributed from the *Diagnostic and Statistical Manual of Mental Disorders* (APA 1987). These measures tend to predict, although not perfectly, the difficulty of achieving abstinence, the severity of withdrawal symptoms, the rapidity of relapse, and the efficacy of replacement therapy (USDHHS 1988).

One final source of vulnerability to nicotine dependence appears to be genetic predisposition. Research with animals has shown that the amount of up-regulation (increased binding in the brain) of nicotine receptors after nicotine exposure is related to genetic constitution, as are certain behavioral and physiologic effects (Marks et al. 1989; Collins 1990). Data from studies with human twins have yielded indices of heritability for cigarette smoking similar to those for drinking alcohol (Hughes 1986; Kozlowski 1991; Carmelli et al. 1992).

Nondrug Factors in Nicotine Dependence

Nondrug factors can affect the prevalence of drug addiction in society as well as its severity in individuals. Some of the factors are the same as those that determine the prevalence and severity of other medical disorders resulting from exposure to toxins. Among the most important factors in determining the prevalence of drug addiction is the exposure to the addicting substance (USDHHS 1988). This factor is no less important in the spread of drug addiction than it is in the spread of disorders such as acquired immunodeficiency syndrome, malaria, and influenza infections. Moreover, social factors can determine the type and frequency of exposure to the etiologic agent, as well as the time frame over which exposure continues. Many nondrug factors associated with both abstinence and relapse appear to operate similarly across addictions. These factors include illness induced by drug dependence (which will at least temporarily interrupt drug use), ability to learn to manage cravings, social reinforcements for abstinence, availability of the substance, cost of the substance, and perception of the risk of using the substance (USDHHS 1988).

Persons vary in their vulnerability to nicotine and other drug addiction, just as they vary in their vulnerability to other medical disorders; some people show a high degree of resistance to the disorder despite multiple exposures to the agent, and others very quickly become addicted (USDHHS 1988). Psychosocial factors affecting the vulnerability of the young and the onset of tobacco use are discussed in Chapter 4.

Smoking as a Risk Factor for Other Drug Use

Introduction

The 1988 Surgeon General's report (USDHHS 1988) showed that among adolescents, cigarette smoking is a risk factor in the development of alcohol use and illegal drug use. The nature of the interrelationship between tobacco and other drug use is complex; in several possible ways, tobacco use may heighten the probability that a young person will use other drugs (Slade 1993; see "Smoking and Other Drug Use" in Chapter 3 and "Behavioral Factors in the Initiation of Smoking" in Chapter 4).

Progression of Drug Use

Kandel (1975) found that studies of the progression of drug use in the 1970s showed that cigarette smoking and alcohol use generally preceded marijuana smoking and other illegal drug use. In fact, Kandel's study concluded that virtually everyone who used illegal drugs such as marijuana or cocaine had previously used cigarettes, alcohol, or both. These findings, primarily among white youths, have been repeatedly extended and replicated (e.g., Fleming et al. 1989; Kandel and Yamaguchi 1993).

More recent data from the Monitoring the Future Project (MTFP) by NIDA (USDHHS 1988) confirm that illegal drug use is rare among those who have never smoked and that cigarette smoking is likely to precede the use of alcohol or illegal drugs. The 1985–1989 MTFP showed that first use of tobacco had occurred at the same age as first use of alcohol for 33 percent of the sample; cigarettes were used before alcohol by 49 percent of the sample. The same survey showed that among those who had used both cigarettes and marijuana, 23 percent began using both in the same year, and 65 percent smoked cigarettes before marijuana. The latter relationship was more pronounced for cocaine: 98 percent of persons who had used both cocaine and cigarettes smoked cigarettes first (see Tables 24–26 in Chapter 3).

These findings were extended in another longitudinal study that assessed 12-, 15-, and 18-year-olds in New Jersey and reinterviewed them at three-year intervals (USDHHS 1987). This study showed that among 15-year-olds, the use of cigarettes, alcohol, or marijuana was the strongest predictor of cocaine use when these same persons were reinterviewed three years later; at that time, the persons using cocaine were likely to be using cigarettes and alcohol as well.

Cigarette smoking in combination with alcohol use appears to be especially predictive of illegal drug use. A longitudinal study by Yamaguchi and Kandel (1984) examined initial data from students in the tenth and eleventh grades in New York State in 1971. When the authors reevaluated the same students in 1981 (average age, 25 years), the most common sequence of drugs used was alcohol, cigarettes, marijuana, illegally used psychoactive or prescription drugs, and other illegal drugs. The investigators found that for 87 percent of the men, alcohol use preceded marijuana use; alcohol and marijuana use preceded other illegal drug use; and use of alcohol, cigarettes, and marijuana preceded the use of other psychoactive drugs. For 86 percent of the women, a similar, but not identical, pattern emerged: alcohol or cigarettes preceded marijuana; alcohol, cigarettes, and marijuana preceded other illegal drugs; and alcohol and either cigarettes or marijuana preceded other psychoactive drugs. These findings were replicated with 1,108 high school seniors in New York in 1988 (Kandel and Yamaguchi 1993). This study confirmed the importance of cigarette and/or alcohol use in the progression of illegal drug use, with early cigarette use being of particular importance in the development of other drug use among females. Early onset of cigarette smoking and/or alcohol use was a strong predictor of further drug use.

The relationship between alcohol use and cigarette smoking is more complex than would be suggested by examining any one survey. In some studies, alcohol is more likely to precede than to follow cigarette smoking. This variability might be explained by the differing study criteria for alcohol use. For example, among many adolescents, alcohol consumption is characterized by the occasional light use of beer or wine—a pattern that often neither escalates into patterns of heavy drinking nor predicts other drug use (Kandel, Marguilies, Davies 1978; Huba, Wingard, Bentler 1981; O'Donnell and Clayton 1982). This finding is consistent with the observation that approximately 85 percent of people who drink alcoholic beverages do so in patterns that do not meet criteria for abuse (USDHHS 1988). On the other hand, consumption of "hard liquor," sometimes accompanied by heavy drinking patterns, appears to develop either along with or following the development of regular patterns of cigarette smoking (Kozlowski et al. 1993; DiFranza and Guerrera 1990). These observations are consistent with the findings of the 1985 NHSDA, which showed that among 12- through 17-year-old adolescents who had never smoked, only 3 percent had binged (i.e., had five or more drinks in a row) in the past 30 days, whereas nearly 40 percent of daily smokers in this age group had binged in the past 30 days (USDHHS 1988).

The progression from cigarette smoking and occasional consumption of alcoholic beverages to heavier drinking and illegal drug use does not appear limited to any single population group. However, there is some evidence that boys with conduct disorders in school and at home may be at especially high risk of progression from any use of tobacco and alcohol to addictive patterns of multiple-drug use. A recent study of 61 males aged 14 through 18 who had conduct disorders found sequences of acquisition of drug use similar to those found among adolescents in general, but with higher rates of addictive use of the tobacco-alcohol-marijuana cluster and earlier initiation of these substances (Mikulich, Young, Crowley 1993).

Cigarette Smoking and Other Drug Use

Cigarette smoking is neither necessary nor sufficient for other drug abuse or dependence. Not all cigarette smokers subsequently abuse other drugs, and a small percentage of abusers of alcohol and illegal drugs do not use tobacco. However, several studies have revealed that cigarette smoking is a predictor of whether an individual is using other drugs and of what that individual's level of other drug use is. The 1985 NHSDA

(USDHHS 1988; Henningfield, Clayton, Pollin 1990) showed that 12- through 17-year-olds who had smoked cigarettes in the past 30 days were approximately 3 times more likely to have consumed alcohol, 8 times more likely to have smoked marijuana, and 22 times more likely to have used cocaine in the past 30 days than those who had not smoked cigarettes. Data from the 1985–1989 MTFP showed that seniors who had smoked cigarettes in the past 30 days were about 1.6 times more likely to have consumed alcohol, 4 times more likely to have smoked marijuana, and 5 times more likely to have used cocaine in the past 30 days than those who had not smoked cigarettes (see "Smoking and Other Drug Use" and Table 23 in Chapter 3).

The 1985 NHSDA (USDHHS 1988; Henningfield, Clayton, Pollin 1990) examined heavier drug use as a function of cigarette smoking. Having 5 or more drinks in succession in the past 30 days, using marijuana on more than 10 occasions, and using cocaine on more than 10 occasions were considered heavier usage of drugs. A strong association was observed between cigarette smoking and other drug use among all age groups in this study, although the percentage of the increases in drug use from the never-smoker to the daily-smoker levels was strongest in the 12- through 17-year-old group (Figure 1). Among these youngest smokers, those who smoked daily were approximately 14 times more likely to have binged on alcohol, 114 times more likely to have used marijuana at least 11 times, and 32 times more likely to have used cocaine at least 11 times than those who had not smoked.

A similar correlation between frequency of alcohol use and level of cigarette smoking was found in a study of 7th- through 12th-grade students in New York State (Welte and Barnes 1987). In the Welte and Barnes study, as in the NHSDA, not only were smoking any cigarettes and drinking alcohol related, but daily smoking was a predictor of binge drinking. These data are consistent with those from a study of adult multiple-drug abusers, which found that severity of nicotine dependence, as measured either by a scale that assesses the strength of a given habit or by cigarettes smoked per day, was correlated directly with severity of alcohol consumption problems, as measured by scores on the Michigan Alcoholism Screening Test (Kozlowski et al. 1993). These data indicate a strong direct relationship between level of nicotine dependence and alcohol abuse but do not in themselves show the direction of the relationship or rule out the possibility that other factors commonly determine the coincidental occurrence of high levels of tobacco and other drug use.

Data from a longitudinal study in which 4,192 students (grades six through eight) were surveyed three times over four years extended the findings that the amount of tobacco use is directly related to other drug use (Bailey 1992). Specifically, this study showed that students who during follow-up periods escalated from low-level use of tobacco or alcohol to heavy-level use were more likely to begin using other psychoactive substances or to increase their use of these substances than students who remained low-level users of tobacco or alcohol (Bailey 1992).

Other studies suggest that the age at onset of cigarette smoking determines the probability of subsequent use of marijuana and of heavy alcohol use. For example, Clayton and Ritter (1985) found not only that cigarette smoking, along with alcohol use, was the most powerful predictor of marijuana use, but also that the effect was strongest when smoking was initiated by age 17. Similarly, Keenan (1988) found that the age at onset of cigarette smoking was significantly younger in people with a history of alcoholism than in those who did not use alcohol.

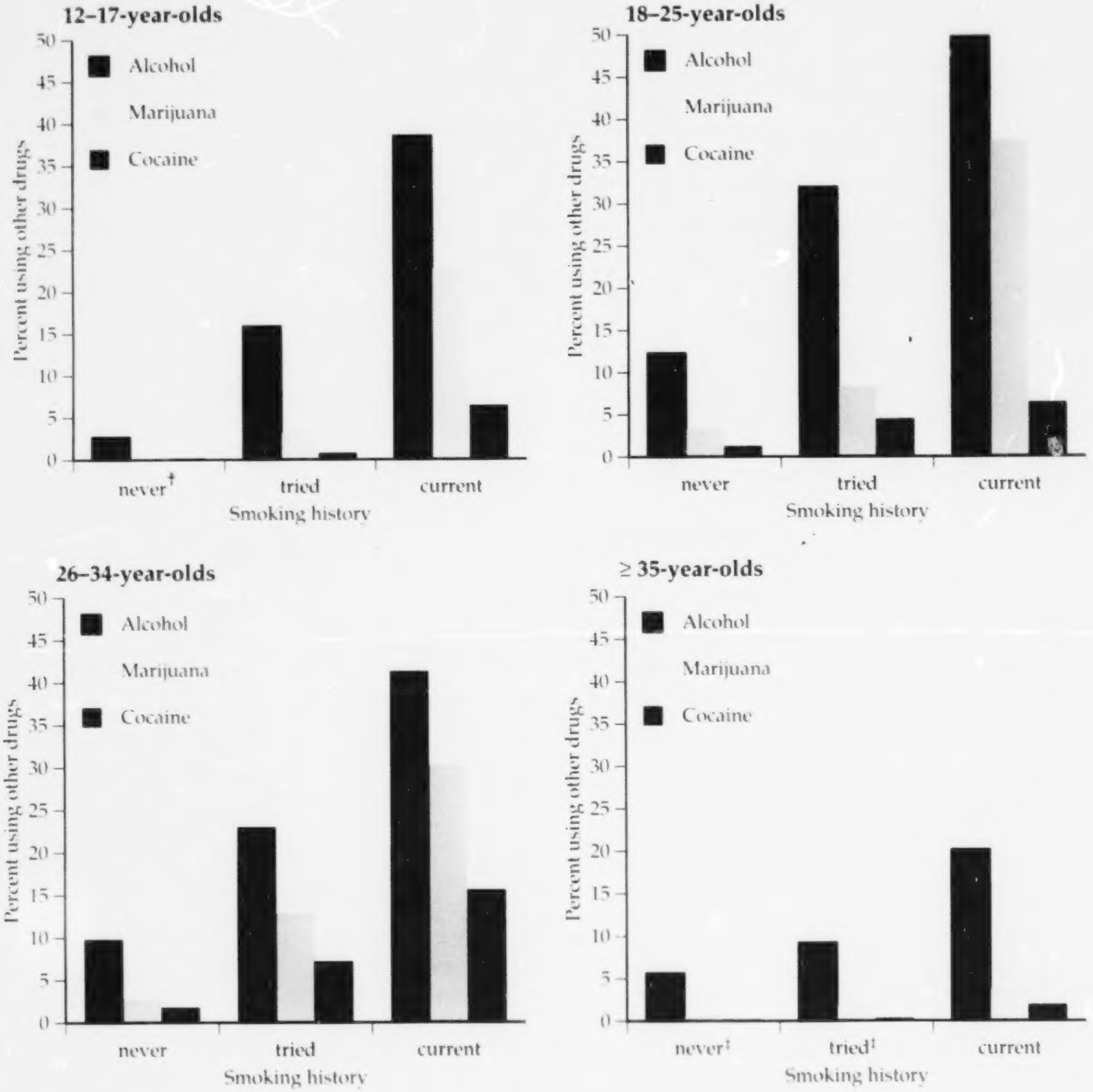
Another study estimated that the relative risk of alcoholism was increased tenfold among cigarette smokers and that people who heavily use alcohol represent approximately one-third of all cigarette smokers (DiFranza and Guerrera 1990). A further analysis of these and additional data led Kozlowski et al. (1993) to conclude that because the association between smoking and drinking is weaker among light smokers, the percentage of heavier smokers who develop problems with alcohol might be greater than 30 percent.

Of all drug users surveyed by the NIDA, cigarette smokers were by far the most likely to report experiencing various features of addiction. Among 12- through 17-year-olds who had used cigarettes, 27 percent were daily users and 20 percent felt dependent; of those who had used alcohol, 6 percent were daily users and 5 percent felt dependent; of those who had used marijuana, 18 percent were daily users and 10 percent felt dependent; of those who had used cocaine, 14 percent were daily users and 6 percent felt dependent (USDHHS 1988; Henningfield, Clayton, Pollin 1990). Cigarette smoking was also, by far, the drug use most commonly associated with withdrawal symptoms. Thus, cigarette smoking not only occurs early in the progression of drug use, it appears to be the first of these drugs to produce features of addiction in young people.

Smoking as a Facilitator for Other Drug Use

A number of mechanisms could explain how cigarette smoking facilitates the use of alcohol and illegal drugs. These mechanisms are not mutually exclusive. Moreover, other variables may operate to nondifferentially increase the use of tobacco and a wide range of other substances. For example, children with conduct disorders are at increased risk of using tobacco, heroin, alcohol,

Figure 1. Use of alcohol, marijuana, and cocaine,[*] by age group, National Household Survey on Drug Abuse, 1985



12–17-year-olds

18–25-year-olds

26–34-year-olds

≥ 35-year-olds

Source: USDHHS (1988).

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[*] The criteria for current use are as follows: alcohol = drank five or more drinks in a row at least 1 day in the past 30 days; marijuana = used marijuana more than 10 times; cocaine = used cocaine more than 10 times (N = 8,814).

[†] Values were under 1 for marijuana and cocaine use.

[‡] Values were under 1 for cocaine use.

cocaine, and other drugs (USDHHS 1988). Similarly, a longitudinal study showed that first-grade children who were characterized by their teachers as either shy or aggressive were significantly more likely than their peers to smoke cigarettes, drink alcohol, and use illegal drugs in their teenage years (Kellam, Ensminger, Simon 1980). Evidence of other predictive factors, however, does not rule out the possibility that young people who smoke have an increased risk of using other drugs.

Morphologic changes in brain structure that have been induced by nicotine exposure might predispose persons to the abuse of other drugs; this mechanism, however, has not yet been experimentally investigated. One possibility is that common pathways of drug-produced reinforcement in the brain might be altered so that the reinforcement produced by subsequent drug exposure is intensified. Central nicotinic receptors are known to be critical mediators of the reinforcing effects of nicotine (USDHHS 1988). In turn, activation of these receptors leads to activation of the dopaminergic reward system, which is critical in mediating the reinforcing effects of a wide variety of abused drugs, including cocaine and heroin. Thus, it is a plausible, but unproven, hypothesis that nicotine exposure would lead to a heightened sensitivity to the reinforcing effects of other drugs of abuse. This hypothesis is supported by the finding that the development of tolerance to nicotine is accompanied by the development of tolerance ("cross-tolerance") to alcohol (Burch et al. 1988; Collins et al. 1988). Other research with animals also shows that nicotine exposure, either alone or in combination with other drugs, may alter the behavioral responses to drugs of abuse, including alcohol and cocaine (Signs and Schechter 1986; Horger, Giles, Schenk 1992). These data together suggest a plausible biological basis for a causal role for tobacco use in the development of other substance abuse patterns, even if this role is shared by other risk factors.

Nicotine produces various effects that have been shown to be produced similarly by one or more other abused drugs; all of these findings were discussed in greater detail in the 1988 Surgeon General's report (USDHHS 1988) and elsewhere (Pomerleau and Pomerleau 1984). Nicotine administration produces feelings of pleasure and euphoria that elevate the same scales on the Addiction Research Center Inventory as the effects of heroin, cocaine, alcohol, and other abused drugs (Henningfield, Miyasato, Jasinski 1985; USDHHS 1988). Human subjects report, and laboratory rats demonstrate, that nicotine produces acute effects that are more like a stimulant than a sedative (Henningfield, Miyasato, Jasinski 1985; USDHHS 1988). Nicotine administration causes cortical EEG activation (increase in alpha and beta frequency, decrease in beta power) that is associated with increased vigilance and improved cognitive function (USDHHS 1988; Pickworth, Herning, Henningfield 1989). Conversely, nicotine deprivation leads to EEG deactivation and concomitant decreases in vigilance and cognitive function (USDHHS 1988; Pickworth, Herning, Henningfield 1989). Nicotine administration modulates the various levels of catecholamines, which are important in the regulation of mood and reactions to stressful stimuli (Pomerleau and Pomerleau 1984; USDHHS 1988).

Partly through its effects on serotonergic systems in the brain, nicotine has some of the same effects on appetite as medications prescribed for this purpose. Nicotine can reduce skeletal muscle tension and thereby contribute to the feelings of pleasurable relaxation often attributed to various abused drugs. For all of these drugs, including nicotine, the specific effect produced is related to the dose of the drug administered. Thus, depending on the dose of the drug or drugs taken, the time since the last dose, and other factors, theoretically the user may achieve certain effects with any of several drugs, achieve various maximal effects through drug combinations, or use certain drug combinations in an effort to reduce certain adverse effects (Gardner 1980).

Certain trends in drug abuse that have become prominent over the past decade increase the potential role of cigarette smoking in the development of other forms of drug use. Specifically, there are increasing reports of smokable preparations of various drugs, including cocaine ("crack"), methamphetamine ("ice"), phencyclidine ("PCP"), and heroin, and marijuana continues to be smoked by large numbers of people (USDHHS 1988). Drug administration via smoking requires the user to learn to regulate dose and to become tolerant of the rapid onset and aversive effects of smoke inhalation. These basic skills may be learned through the process of becoming dependent on tobacco, as is discussed in "Developmental Stages of Smoking" in Chapter 4 of this report and in the 1988 report. Once learned, these skills can be transferred to other smoked drugs and can facilitate the process of experimentation with such drugs, as well as increase the potential for addiction.

Health Consequences of Smokeless Tobacco Use Among Young People

Introduction

Smokeless tobacco includes two main types: chewing tobacco and snuff. These products are made from the same type of dark- or burley-leaved tobacco. Most smokeless tobacco is grown in Kentucky, Pennsylvania, Tennessee, Virginia, West Virginia, and Wisconsin. Leaves are generally aged one to three years, but snuff tobacco leaves are aged longer than chewing tobacco leaves (Shapiro 1981). People who use chewing tobacco place a wad of loose-leaf tobacco or a plug of compressed tobacco in their cheek; snuff users place a small amount of powdered or finely cut tobacco (loose or wrapped in a paper pouch) between their gum and cheek (USDHHS 1992b). Smokeless tobacco users then suck on the tobacco and spit out the tobacco juices with accompanying saliva. As a consequence of the way in which smokeless products are used, smokeless tobacco is sometimes referred to as spit or spitting tobacco (USDHHS 1992b).

The most notable health consequences associated with smokeless tobacco use include halitosis (bad breath), discoloration of teeth and fillings, abrasion of teeth, dental caries, gum recession, leukoplakia, nicotine dependence, and various forms of oral cancer (USDHHS 1986b, 1992a; WHO 1988). Specifically, smokeless tobacco use has been implicated in cancers of the gum, mouth, pharynx, larynx, and esophagus (USDHHS 1986b; Winn 1988) and has also been indicated in early reports of the development of verrucous carcinoma (Winn 1988). Smokeless tobacco use may also play a role in cardiovascular disease and stroke, through increases in blood pressure, vasoconstriction, and irregular heartbeat (Hsu et al. 1980; Gritz et al. 1981; Schroeder and Chen 1985). Since nearly 25 percent of adult smokeless tobacco users also smoke cigarettes (CDC 1993b), the effects on the oral cavity may be synergistic, and the risks of developing cancer of the oral cavity and pharynx noticeably increase (Blum 1980).

Epidemiologic Evidence

The 1986 Surgeon General's report on smokeless tobacco use concluded that there is no safe use of tobacco. Despite that report and subsequent legislation, restrictions, and follow-up reports (USDHHS 1992a, b; see "Warning Labels on Tobacco Products" in Chapter 6 and "Smokeless Tobacco Advertising and Promotional Expenditures" in Chapter 5), smokeless tobacco use in the United States remains a serious concern. The use of smokeless tobacco by adults has remained relatively constant at about 5 percent for males and 1 percent for females. However, smokeless tobacco use among high school males has become markedly more prevalent in the past two decades; about 20 percent report using smokeless tobacco in the past month (see "Current Use of Smokeless Tobacco" in Chapter 3 for documentation and further discussion of the prevalence of smokeless tobacco use). In some states, nearly one out of three high school males uses smokeless tobacco. There is little indication that use among young people is significantly declining (Glover et al. 1988; Boyd and Glover 1989; USDHHS 1992b; see "Current Use of Smokeless Tobacco" in Chapter 3).

Smokeless tobacco use primarily begins in early adolescence; some research indicates an average age of onset of 10 years (USDHHS 1992b). Among high school seniors who had regularly used smokeless tobacco, 23 percent reported that they had first tried the product by the sixth grade, and 53 percent by the eighth grade (see "Grade When Smokeless Tobacco Use Begins" in Chapter 3).

Health Consequences

A recent report of the Office of Inspector General (USDHHS 1992b) concluded that smokeless tobacco use causes serious, but generally not fatal, short-term health consequences among young people. The primary health consequences during adolescence include leukoplakia, gum recession, nicotine addiction, and increased risk of becoming a cigarette smoker. Leukoplakia and/or gum recession occur in 40 to 60 percent of smokeless tobacco users (USDHHS 1992b).

Leukoplakia has been defined by the World Health Organization as a lesion of the soft tissue that consists of a white patch (mucosal macule) or plaque that cannot be scraped off (Kramer et al. 1978; Axéll et al. 1984). Greer and Poulson (1983) examined 117 high school students who were smokeless tobacco users; oral soft-tissue lesions were found in 49 percent of these students. Oral leukoplakias carry a five-year malignant transformation potential of about 5 percent (Pindborg 1980, 1985; Bouquot 1987, 1991). If smokeless tobacco use ceases, the leukoplakia appears to regress or resolve entirely (Christen, McDonald, Christen 1991).

Gingival tissue recession (or gum recession) commonly occurs in the area of the oral cavity immediately adjacent to where smokeless tobacco is held. When smokeless tobacco remains exclusively in a specific intraoral location, gingival recession occurs among 30 percent (Weintraub et al. 1990) to over 90 percent (Schroeder et al. 1988) of users. Modéer, Lavstedt, and Åhlund (1980) found that snuff use among 13- and

14-year-old students could directly affect the gingival tissues, causing gingivitis, or gum inflammation. In a study of 565 adolescent male students with gingivitis in Georgia, Offenbacher and Weathers (1985) found that gingival recession was significantly more prevalent, and the odds of developing this condition were nine times greater, among smokeless tobacco users than among nonusers. Navy recruits from 45 states were examined to determine if smokeless tobacco use was associated with gingival recession (Weintraub et al. 1990). Results of the study showed that 31 percent of heavy users and 19 percent of nonusers or low users had gingival recession. Users' age and the intensity of smokeless tobacco use were significant factors in explaining variations in the degree of gingival recession. Two additional studies of adolescents failed to show an association between the use of smokeless tobacco and gingival recession (Wolfe and Carlos 1987; Creath et al. 1988), possibly because most of the users had been using the product for a short time.

Nicotine Addiction

The addictive qualities of smokeless tobacco are also a matter of major concern (Christen and Glover 1981; Glover, Christen, Henderson 1981; Glover et al. 1989; Hatsukami, Nelson, Jensen 1991). Smokeless tobacco users develop a nicotine dependency similar to that of cigarette smokers (Benowitz et al. 1988). This is not surprising, since smokeless tobacco users absorb at least as much nicotine as smokers do (Russell, Jarvis, Feyerabend 1980)—perhaps as much as twice the amount (Benowitz et al. 1988). The high pH of saliva favors absorption of nicotine through oral mucosa, and the degree of absorption increases with the increasing pH of the tobacco product. The rate of absorption of nicotine from snuff is particularly rapid (Russell, Jarvis, Feyerabend 1980; Edwards, Glover, Schroeder 1987). With continued use of smokeless tobacco, blood nicotine levels remain relatively high; these levels fall more slowly after smokeless tobacco is removed from the mouth than after a cigarette has been smoked (Benowitz et al. 1988).

Adolescents develop physical dependence from smokeless tobacco use, as is evidenced by their experience of withdrawal symptoms when they try to quit (see "Smokeless Tobacco Cessation" in Chapter 6). Smokeless tobacco cessation produces withdrawal symptoms that are similar to those for smoking cessation (Hatsukami, Gust, Keenan 1987), including cravings, irritability, distractibility, and hunger. Adolescents who are most addicted to nicotine appear to be less able to quit (Eakin, Severson, Glasgow 1989). Thus, as is seen with cigarette use (see "Adult Implications of Adolescent Smoking" in Chapter 3 and "Adolescent Smoking Behavior as a Risk Factor for Subsequent Smoking" in Chapter 4), adolescents who are heavy smokeless tobacco users are likely to become adult users.

The addictive potential of smokeless tobacco use is aggravated by the fact that some smokeless products are highly effective in the initiation process and are even termed "starter products" by one smokeless tobacco company (Marsee v. United States Tobacco Company 1989; Henningfield and Nemeth-Coslett 1988). These products tend to be low in nicotine concentration and low in pH (thus reducing absorption); some are in a unit dosage form ("tobacco pouch"), which helps first-time users avoid placing too much of the substance in their mouths. These products may have contributed to the reversal of the demographics of smokeless tobacco users from 1970 to 1986. In 1970, the majority of smokeless tobacco users were 50 years old and older; by 1986, the majority were 35 years old and younger (USDHHS 1987, 1988). As is discussed in Chapter 5 (see "Smokeless Tobacco Advertising and Promotional Expenditures"), marketing and advertising factors have been identified as having instilled the general perception that smokeless tobacco products are safe and socially acceptable (Connolly et al. 1986; USDHHS 1987; Glover et al. 1989). Marketing strategies included a heavy reliance on distributing free samples of product types designed to introduce new users to what one company termed the "graduation process" (Marsee v. United States Tobacco Company 1989). Advertising strategies then encouraged new users to experience greater "satisfaction" and "pleasure" by switching to maintenance products higher in nicotine concentration and pH (Marsee v. United States Tobacco Company 1989; Henningfield and Nemeth-Coslett 1988).

Smokeless Tobacco Use as a Risk Factor for Cigarette Smoking

Young people who use smokeless tobacco appear to be at greater risk to smoke cigarettes than are nonusers. Among smokeless tobacco users, 12 to 43 percent also smoke cigarettes (Eakin, Severson, Glasgow 1989; Williams 1992; CDC 1993b; Stevens et al., in press; see Table 23 in Chapter 3). In the 1986–1989 MTFP, 44 percent of high school seniors had tried both smokeless tobacco and cigarettes; of those, 63 percent had tried smokeless tobacco either before or at about the same time as cigarettes (see Table 38 in Chapter 3). In a prospective study, Ary, Lichtenstein, and Severson (1987) found that smokeless tobacco users were significantly more likely than nonusers to initiate cigarette smoking. Smokeless tobacco users were also more likely to increase their use of cigarettes over a one-year period. For adolescents who use both smokeless tobacco and cigarettes, cessation of one substance may lead to a direct increase in the other (Biglan, La Chance, Benowitz, unpublished data).

Smokeless Tobacco Use as a Risk Factor for Other Drug Use

Smokeless tobacco use is also predictive of other drug use. In a study of more than 3,000 male adolescents interviewed twice at nine-month intervals about their use of various psychoactive substances (Ary, Lichtenstein, Severson 1987), the main findings were that (1) smokeless tobacco users were significantly more likely to use cigarettes, marijuana, or alcohol than nonusers, (2) users of smokeless tobacco were significantly more likely to take up the use of these other substances by the second interview if they were not using them at the first, and (3) adolescents who were using any of these substances at the first interview were significantly more likely to increase their use of the substance if they also used smokeless tobacco.

Two other facts are important to consider when evaluating the role of smokeless tobacco products in the use of cigarettes and other substances. First, the overall impact of smokeless tobacco is currently limited primarily to males (the main users of these substances) (USDHHS 1986b, 1990). Second, smokeless tobacco users in the Ary, Lichtenstein, and Severson (1987) study, as well as in most other surveys, tend to initiate their tobacco use at about the same age as cigarette smokers or at a slightly earlier age (see "Grade When Use of Smokeless Tobacco and Cigarettes Begins" in Chapter 3).

Conclusions

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1. Cigarette smoking during childhood and adolescence produces significant health problems among young people, including cough and phlegm production, an increased number and severity of respiratory illnesses, decreased physical fitness, an unfavorable lipid profile, and potential retardation in the rate of lung growth and the level of maximum lung function.

2. Among addictive behaviors, cigarette smoking is the one most likely to become established during adolescence. People who begin to smoke at an early age are more likely to develop severe levels of nicotine addiction than those who start at a later age.

3. Tobacco use is associated with alcohol and illicit drug use and is generally the first drug used by young people who enter a sequence of drug use that can include tobacco, alcohol, marijuana, and harder drugs.

4. Smokeless tobacco use by adolescents is associated with early indicators of periodontal degeneration and with lesions in the oral soft tissue. Adolescent smokeless tobacco users are more likely than nonusers to become cigarette smokers.

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Introduction

Understanding national trends and patterns of tobacco use among adolescents is crucial to the public health effort to reduce tobacco-related morbidity and mortality. Along with information on young people's knowledge, attitudes, and perceptions concerning tobacco use, these data can help elucidate historical patterns, suggest target groups for programs to prevent tobacco use, determine the need for future interventions, assess the effect of national campaigns against tobacco use, and contribute to predictions of the future burden of tobacco-related disease.

Previous reports from the Surgeon General have described tobacco use among the nation's youth (U.S. Department of Health, Education, and Welfare [USDHEW] 1979a; U.S. Department of Health and Human Services [USDHHS] 1989b). The following analysis both updates and expands these discussions. In particular, the analysis incorporates cross-sectional data from four national surveillance systems that track health behaviors (including tobacco use) among adolescents and from one adult survey with information on older adolescents (Table 1). Data are also used from a national longitudinal survey of adolescents and young adults.

The National Teenage Tobacco Surveys (NTTS) cited in this chapter were conducted by the U.S. Public Health Service and the U.S. Department of Education in 1968, 1970, 1972, 1974, and 1979; a modified version of the survey was conducted in 1989 as the Teenage Attitudes and Practices Survey (TAPS). The National Household Surveys on Drug Abuse (NHSDA) cited were conducted nine times from 1974 through 1991 by the National Institute on Drug Abuse (NIDA); the survey is now sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA). The Monitoring the Future Project (MTFP) surveys included were conducted yearly from 1976 through 1992 for NIDA by the University of Michigan's Institute for Social Research (ISR). The Youth Risk Behavior Survey (YRBS), cited extensively throughout this chapter, was conducted in 1991 by the Centers for Disease Control (CDC) as a component of the Youth Risk Behavior Surveillance System. The National Health Interview Surveys (NHIS) cited in this report included yearly data on cigarette smoking during 11 years from 1970 through 1991. Survey methodology varied across these surveillance systems (see Appendix 1, "Sources of Data," for more detail on methodologic characteristics), and the different surveys offered several measures of tobacco use (see Appendix 2, "Measures of Cigarette Smoking," and Appendix 3, "Measures of Smokeless Tobacco Use").

The most comparable of these data sources are TAPS, the NHSDA, the MTFP, and the YRBS. Because the questions used, the ages sampled, and the sites and modes of administration (school-based self-administered questionnaires vs. household-based telephone and in-person interviews) differ, however, even these data are not directly comparable. The MTFP, for example, consistently reports higher prevalence estimates than the two household surveys, mainly because the study population is limited to high school seniors; these respondents, who are usually 17 or 18 years old, are considerably older than the 12- through 18-year-old population included in TAPS and the NHSDA. When possible, most of the comparisons presented in this chapter include age- or grade-specific estimates. However, even after controlling for age differences, the estimates on some measures of tobacco use from the household surveys are lower than the estimates from the school surveys (see Appendix 2).

The purpose of this chapter is to document reported trends and patterns of tobacco use in one source. Differences in the age of the target populations employed, in the setting of the survey, in the wording of questions, and in other factors may cause apparent differences in the actual values of some of the estimates reported here. However, these differences are frequently resolved when methodological issues are taken into consideration. Incorporating data from several types of data collection systems has revealed a number of consistencies in patterns and trends of tobacco-use behaviors that apply to both school-based and household-based sample frames (and thus to school attenders, infrequent school attenders, and dropouts).

Table 1. Sources of national data on tobacco use among young people, 1968–1992

Survey title	Abbreviated title	Sponsoring agency or organization	Type of survey	Years
National Teenage Tobacco Surveys; 1989 Teenage Attitudes and Practices Survey	NTTS, TAPS	National Clearinghouse for Smoking and Health, National Cancer Institute, National Institutes of Health; National Institute of Education; Office on Smoking and Health (OSH), Centers for Disease Control and Prevention (CDC)*	Cross-sectional	1968, 1970, 1972, 1974, 1979, 1989
National Household Surveys on Drug Abuse	NHSDA	National Institute on Drug Abuse/ Substance Abuse and Mental Health Services Administration	Cross-sectional	1974, 1976, 1977, 1979, 1982, 1985, 1988, 1990, 1991
Monitoring the Future Project	MTFP	National Institute on Drug Abuse; University of Michigan, Institute for Social Research	Cross-sectional and longitudinal	1976–1992 annual surveys; 1976–1986 respondents contacted 5–6 years later
Youth Risk Behavior Survey	YRBS	Division of Adolescent and School Health, CDC	Cross-sectional (national, as well as state and local)	1991
National Health Interview Surveys	NHIS	National Center for Health Statistics (NCHS), CDC	Cross-sectional	1970, 1974, 1978–1980, 1983, 1985, 1987–88, 1990, 1991

Sources: **NTTS**: U.S. Department of Health, Education, and Welfare (1972, 1976, 1979b); **TAPS**: CDC (1991a); Allen et al. (1991, 1993); Moss et al. (1992); **NHSDA**: Abelson and Atkinson (1975); Abelson and Fishburne (1976); Fishburne, Ableson, Cisin (1980); Gfroerer (1993); Miller et al. (1983); U.S. Department of Health and Human Services [USDHHS] (1988a, 1990a, 1991a, 1992a, 1993); **1991 NHSDA**: CDC, OSH (unpublished data); **MTFP**: Bachman, Johnston, O'Malley (1980a, b, 1981, 1984, 1985, 1987, 1991); Johnston, Bachman, O'Malley (1980a, b, 1982, 1984, 1986, 1991, 1992); Johnston, O'Malley, Bachman (1991a, b, 1992a, b, in press); **1990–1992 MTFP surveys**: Institute for Social Research, University of Michigan (unpublished data); **YRBS**: Kolbe (1990); CDC (1992c, d); Kolbe, Kann, Collins 1993; CDC, Division of Adolescent and School Health (unpublished data); **NHIS**: NCHS (1958, 1975, 1985, 1988a, b, 1989); USDHHS (1992a); **1970, 1978–1980, 1987–1988 NHIS**: CDC, OSH (unpublished data).

*The 1989 TAPS was partially sponsored by the American Cancer Society.

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Mode of survey administration	Response rate	Ages/ grades	Sample size	Type of tobacco use examined
Telephone interview, in-person interview, mailed questionnaire	82% in 1989	12–18 years	2,553–9,965	Smoking: all years Smokeless: 1989
Household interview	Mean of approximately 80%; 84% in 1991	17–19 years (trend data);	371–3,429	Smoking: all years Smokeless: 1988–1991
		12–18 years (1991 analysis);	9,086	
		30–39 years (retrospective 1991 analysis)	6,388	
Self-administered in school	77%–86% of sampled seniors; 66%–80% of selected schools; 70%–80% of seniors remained in panel 5 years later	12th grade: 1976–1992	15,091–18,448[†]	Smoking: all years Smokeless: 1986–1989, 1992
		10th grade: 1992	14,726[‡]	
		8th grade: 1992	18,478[§]	
		23–24 years old when contacted 5–6 years later	13,665 in panel	
Self-administered in school	For national survey: 90% of sampled students; 75% of selected schools	9th–12th grades	12,272 in national survey	Smoking and smokeless
Household interview, limited telephone interview	Approximately 85%–90%	18–19 years (trend analyses for 1974–1991);	453–1,385	Smoking: all years
		≥ 18 years (for reconstructed prevalence, using 1970, 1978–1980, and 1987 surveys);	148,433	
		≥ 18 years (for age of initiation of regular smoking analyses among females, 1970, 1978–1980, 1987–1988)	115,337	

[†] The Institute for Social Research usually reports the N (weighted), which is approximately equal to the sample size. Cases are weighted to account for differential probability of selection and then normalized to average 1.0. The range for N (weighted) for questions on smokeless tobacco between 1986 and 1992 = 2,553–2,991.

[‡] N (weighted) for smokeless tobacco = 7,093.

[§] N (weighted) for smokeless tobacco = 8,441.

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Cigarette Smoking Among Young People in the United States

Recent Patterns of Cigarette Smoking

Ever Smoking

The proportion of adolescents classified as ever smokers (i.e., those who had tried a cigarette [see Appendix 2 for variations in this measure]) varied across survey systems (Table 2). In the 1989 TAPS, 47 percent of students aged 12 through 18 had tried smoking. In the 1991 NHSDA, the prevalence for this same age range was 42 percent. The different estimates between these two household surveys may reflect actual decreased prevalence during the intervening two years or may result from sampling error, from slight differences in response to different survey questions, or from the different way these home-based surveys were administered (by telephone in TAPS and in person in the NHSDA). Of the two self-administered school surveys, the 1991 YRBS reported a higher prevalence of ever smoking (70 percent) than the 1992 MTFP (62 percent), even though the YRBS included students in grades 9 through 12 (age range generally 14 through 18 years), whereas the MTFP was limited to high school seniors. This difference may partly result from the questions each survey used to elicit information on ever smoking. The MTFP survey asked, "Have you ever smoked cigarettes?", and the YRBS asked a question that might have drawn additional affirmative responses: "Have you ever tried or experimented with cigarette smoking, even one or two puffs?"

What stands out from all four surveys is that by age 18, about two-thirds of adolescents in the United States have tried smoking. Also evident across the surveys is that the prevalence of ever smoking is greater (if only slightly so in one survey) among males than females. Findings by racial/ethnic groups were generally in accord across the surveys: whites had the highest prevalence of ever smoking and blacks the lowest in TAPS, the NHSDA, and the MTFP; Hispanics had the highest prevalence of the three groups in the YRBS.

Ever smoking increased as a function of increasing age or grade in all four surveys. Adolescents living in the north-central region of the United States were the most likely to report having smoked (Table 2). Prevalence for individual states were available from the Youth Risk Behavior Surveillance System, which besides its yearly national YRBS also conducts individual surveys in selected states and cities. In 1991, the percentage of students who had tried smoking ranged from 49 to 82 percent (median, 71 percent) (Table 3).

Current Smoking

The overall national prevalence of current smoking (i.e., having smoked within the last 30 days) for persons 12 through 18 years old was estimated to be 16 percent in the 1989 TAPS and 13 percent in the 1991 NHSDA (Table 4). These estimates suggest that at least 3.1 million U.S. adolescents are current smokers. Among high school seniors, the prevalence of past-month smoking was 28 percent in the 1992 MTFP; 28 percent of high school students were past-month smokers in the 1991 YRBS.

In all the surveys, current prevalence among males was equal to or slightly higher than current prevalence for females. This pattern differs from that reported for the late 1970s and mid-1980s, when the prevalence for adolescent females was generally higher than that for adolescent males (USDHEW 1979b; USDHHS 1989b).

The national prevalence of past-month smoking among adolescents was higher for whites than for Hispanics and was lowest for blacks (Table 4). Pooled data from the 1985–1989 MTFP provided information on smoking among Asian American and Native American adolescents (Bachman et al. 1991). Past-month smoking prevalence was higher for Native American male (37 percent) and female (44 percent) seniors than for white male (30 percent) and female (34 percent) seniors. Current smoking was about as common for Asian American male (17 percent) and female (14 percent) seniors as it was for black male (16 percent) and female (13 percent) seniors. Data on Hispanic smoking prevalence, presented in the same report, indicate that smoking prevalence among Hispanic high school seniors from 1985 through 1989 ranked between that of white and black high school seniors, as it did in TAPS, the NHSDA, and the YRBS.

Current prevalence increased with increasing age or grade (Table 4). TAPS and the NHSDA reported smoking prevalences for persons 17 and 18 years old that were slightly lower than those of 12th-grade students surveyed by the MTFP and the YRBS. Prevalence estimates from TAPS and the NHSDA for persons 15 and 16 years old were considerably lower than for 9th- and 10th-grade high school students in the MTFP and the YRBS. These estimates are consistent with the argument that estimates of cigarette smoking from household surveys may underreport actual use, especially for younger adolescents.

Table 2. **Percentage of young people who have ever smoked cigarettes, by gender, race/Hispanic origin, age/grade, and region, Teenage Attitudes and Practices Survey (TAPS), National Household Surveys on Drug Abuse (NHSDA), Monitoring the Future Project (MTFP), Youth Risk Behavior Survey (YRBS), United States, 1989, 1991, 1992**

Characteristic	1989 TAPS[*]	1991 NHSDA[†]	1992 MTFP[‡,§]	1991 YRBS[||]
Overall	46.5	41.9	61.8	70.1
Gender				
Male	48.3	44.4	63.5	70.6
Female	44.4	39.3	60.2	69.5
Race/Hispanic origin				
White, non-Hispanic	49.5	46.5	65.3	70.4
Male	51.5	49.1	66.2	71.4
Female	49.3	43.7	64.6	69.3
Black, non-Hispanic	36.4	28.1	42.6	67.2
Male	38.7	31.0	45.5	64.7
Female	34.1	25.0	40.4	69.3
Hispanic	43.1	34.4	NA[¶]	75.3
Male	42.5	36.1		75.7
Female	43.7	32.5		74.9
Age/grade				
12–14 years	29.7	26.0		
15–16 years	52.5	45.9		
17–18 years	63.9	60.9		
8th grade			45.2	
9th grade				64.8
10th grade			53.5	68.3
11th grade				72.8
12th grade			61.8	74.5
Region				
Northeast	46.0	39.7	63.7	70.6
North Central	47.9	46.2	65.2	73.0
South	46.5	41.1	61.1	71.3
West	45.0	40.3	56.5	65.0

Sources: **1989 TAPS**: Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (OSH) (unpublished data); **1991 NHSDA:** CDC, OSH (unpublished data); **1992 MTFP:** Johnston, O'Malley, Bachman (in press); Institute for Social Research, University of Michigan (unpublished data); **1991 YRBS:** CDC (1992c); CDC, Division of Adolescent and School Health (unpublished data).

[*] 1989 TAPS, aged 12–18 years. Based on responses to the questions, "Have you ever smoked a cigarette?" and "Have you ever tried or experimented with cigarette smoking, even a few puffs?" Respondents who had smoked a cigarette, even a few puffs, were classified as ever smokers.

[†] 1991 NHDSA, aged 12–18 years. Based on response to the question, "About how old were you when you first tried a cigarette?" ("Never tried a cigarette" was a precoded response.)

[‡] 1992 MTFP survey. Based on response to the question, "Have you ever smoked cigarettes?" Respondents who reported that they had tried cigarettes at least once or twice were classified as ever smokers.

[§] With the exception of data for 8th- and 10th-grade students, all other data points for the MTFP survey reflect estimates for high school seniors.

[||] 1991 YRBS, grades 9–12. Based on response to the question, "Have you ever tried cigarette smoking, even one or two puffs?"

[¶] NA = Not available.

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Table 3. Percentage of high school students who use cigarettes, by gender, Youth Risk Behavior Surveys, United States and selected U.S. sites, 1991

	Lifetime cigarette use*			Current cigarette use[†]			Frequent cigarette use[‡]		
Site	**Female**	**Male**	**Total**	**Female**	**Male**	**Total**	**Female**	**Male**	**Total**
Weighted data									
National survey	70	71	70	27	28	28	12	13	13
State surveys									
Alabama	70	79	74	24	32	28	11	16	13
Georgia	66	72	69	22	26	24	10	12	11
Idaho	56	65	61	22	24	23	12	14	13
Nebraska	70	75	72	28	30	29	15	15	15
New Mexico	82	81	82	30	30	30	13	14	13
New York[§]	72	70	71	32	28	30	18	17	17
Puerto Rico[‖]	46	54	50	13	18	16	3	5	4
South Carolina	72	76	74	25	26	26	13	13	13
South Dakota	68	71	69	32	30	31	17	16	16
Utah	43	55	49	16	18	17	8	8	8
Local surveys									
Chicago	72	73	72	13	20	16	4	7	6
Dallas	70	76	73	11	16	14	4	4	4
Fort Lauderdale	65	65	65	18	13	16	10	6	8
Jersey City	73	70	72	17	16	16	4	4	4
Miami	66	66	66	12	17	15	4	8	6
Philadelphia	82	70	76	22	17	20	11	8	10
San Diego	64	71	68	18	18	18	7	7	7
Unweighted data[¶]									
State surveys									
Colorado[§]	73	74	74	28	27	27	13	14	14
District of Columbia[‖]	70	60	65	5	7	6	2	2	2
Hawaii	70	70	70	27	25	26	12	13	13
Montana	68	71	69	24	24	24	13	12	12
New Hampshire	71	71	71	28	27	27	16	15	15
New Jersey[§]	67	61	64	NA**	NA	NA	NA	NA	NA
Oregon	63	65	64	22	22	22	9	10	9
Pennsylvania[§]	69	73	71	28	28	28	16	15	15
Tennessee	72	75	74	30	30	30	16	16	16
Wisconsin	72	73	73	30	32	31	16	17	16
Wyoming	70	74	72	27	28	28	15	17	16
Local surveys									
Boston	68	68	68	15	16	15	6	9	7
New York City	76	68	72	26	16	21	12	6	9
San Francisco	61	63	62	14	15	14	7	6	6

Source: Centers for Disease Control (1992d).

*Ever tried cigarette smoking, even one or two puffs.

[†] Smoked cigarettes on 1 or more of the 30 days preceding the survey.

[‡] Smoked cigarettes on 20 or more of the 30 days preceding the survey.

[§] Surveys did not include students from the largest city.

[‖] Categorized as a state for funding purposes.

[¶] Fourteen sites had overall response rates below 60% or had unavailable documentation; weighted estimates were not reported.

**NA = Not available.

Table 4. Percentage of young people who currently smoke cigarettes (within the past 30 days), by gender, race/Hispanic origin, age/grade, and region, Teenage Attitudes and Practices Survey (TAPS), National Household Surveys on Drug Abuse (NHSDA), Monitoring the Future Project (MTFP), Youth Risk Behavior Survey (YRBS), United States, 1989, 1991, 1992

Characteristic	1989 TAPS[*]	1991 NHSDA[†]	1992 MTFP[‡,§]	1991 YRBS[‖]
Overall	15.7	13.1	27.8	27.5
Gender				
Male	16.0	13.5	29.2	27.6
Female	15.3	12.8	26.1	27.3
Race/Hispanic origin				
White, non-Hispanic	18.5	15.4	31.8	30.9
Male	18.7	15.5	32.1	30.2
Female	18.2	15.3	31.5	31.7
Black, non-Hispanic	6.1	5.3	8.2	12.6
Male	7.8	6.0	10.8	14.1
Female	4.9	4.6	5.8	11.3
Hispanic	11.8	10.1	NA[¶]	25.3
Male	11.8	9.5		27.8
Female	11.7	10.8		22.9
Age/grade				
12–14 years	5.9	3.9		
15–16 years	17.5	14.0		
17–18 years	27.5	25.5		
8th grade			15.5	
9th grade				23.2
10th grade			21.5	25.2
11th grade				31.6
12th grade			27.8	30.6
Region				
Northeast	17.6	14.7	29.6	23.7
North Central	16.6	14.9	31.7	36.5
South	14.0	11.7	26.4	24.8
West	15.5	12.3	22.8	23.1

Sources: **1989 TAPS:** Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (OSH) (unpublished data); **1991 NHSDA**: CDC, OSH (unpublished data); **1992 MTFP:** Johnston, O'Malley, Bachman (in press); Institute for Social Research, University of Michigan (unpublished data); **1991 YRBS:** CDC (1992c); CDC, Division of Adolescent and School Health (unpublished data).

[*] 1989 TAPS, aged 12–18 years. Based on responses to the questions, "Have you ever smoked a cigarette?" and "Think about the last 30 days. On how many of these days did you smoke?"

[†] 1991 NHSDA, aged 12–18 years. Based on response to the question, "When was the most recent time you smoked a cigarette?"

[‡] 1992 MTFP survey. Based on response to the question, "How frequently have you smoked cigarettes during the last 30 days?"

[§] With the exception of data for 8th- and 10th-grade students, all other data points for the MTFP survey reflect estimates for high school seniors.

[‖] 1991 YRBS, grades 9–12. Based on response to the question, "During the past 30 days, on how many days did you smoke cigarettes?"

[¶] NA = Not available.

Past-month smoking was generally most common in the north-central region of the United States and least prevalent in the West and the South (Table 4). Among the available state and local surveys of high school students (Table 3), the percentage of students who were current smokers ranged from 6 to 31 percent (median 27 percent). From the weighted surveys, current smoking prevalence was lowest in Puerto Rico and Utah and highest in South Dakota, New Mexico, and New York (excluding New York City).

Frequent and Heavy Smoking

In the 1989 TAPS, 8 percent of U.S. adolescents 12 through 18 years old were frequent smokers (i.e., had smoked on 20 or more of the 30 days preceding the survey) (Table 5). In 1991, 13 percent of high school students surveyed in the YRBS were frequent smokers. In the 1991 NHSDA, 7 percent of persons 12 through 18 years old were heavy smokers (i.e., had smoked at least one-half pack per day); 10 percent of high school seniors in the 1992 MTFP survey were heavy smokers. Males were slightly more likely than females to report frequent or heavy smoking (Table 5).

To a greater extent than was found for current smoking, white adolescents were more likely than black or Hispanic adolescents to be frequent or heavy smokers. Among white adolescents in the different surveys, frequent and heavy smoking were 2.8 to 7.5 times more common than among black adolescents and 2.3 to 2.6 times more common than among Hispanic adolescents.

As was noted for both ever smoking and current smoking, frequent and heavy smoking increased with increasing age or grade. Frequent and heavy smoking were more prevalent in the north-central and northeast regions and less prevalent in the South and the West.

Sociodemographic Risk Factors for Smoking

In its surveys of high school seniors from 1985 through 1989, the MTFP elicited data on several possible sociodemographic risk factors for adolescent smoking (Table 6). The surveys found, for example, that students who lived alone had the highest prevalences of past-month smoking (47 percent) and heavy smoking (28 percent). Living in a single-parent household increased the risk of past-month or heavy smoking only when the mother was the absent parent. Data from the 1968, 1970, 1972, 1974, and 1979 NTTS indicate higher smoking prevalences among youth living in households with fewer than two parents or parent surrogates (USDHEW 1972, 1976, 1979b). The available published reports, however, did not provide more detail on the exact structure of the household.

The 1989 TAPS examined other aspects of family structure for possible associations with adolescent smoking status (Allen et al. 1993). The survey findings showed that youths 12 through 16 years old who were current smokers were almost twice as likely to be home without a parent or other adult for 10 or more hours a week than were teens who had never smoked. Furthermore, TAPS teens who said that they discussed serious problems with friends rather than with a parent, other relative, or another adult were two times more likely to be current smokers than were teens who reported discussing serious problems with their parents (Moss et al. 1992).

The 1985–1989 MTFP reported an inverse relationship between both past-month and heavy smoking and the population density of the locales in which the seniors grew up (Table 6); those seniors who grew up on a farm or in the country were more likely to smoke than those who grew up in large cities. The MTFP also found that as school performance among high school seniors declined from above average to below average, past-month smoking prevalence increased from 22 to 41 percent, and heavy smoking prevalence increased from 7 to 21 percent. A similar relationship was observed in the 1989 TAPS (Moss et al. 1992).

Postgraduation plans were another predictor of smoking behavior among MTFP seniors. Students who said they planned to complete four years of college were less likely to be past-month smokers (24 percent) or heavy smokers (7 percent) than were those who did not plan to get a college degree (39 percent were past-month smokers, 20 percent were heavy smokers). Males who planned to enter the armed forces after high school were more likely to be past-month smokers (31 percent) or heavy smokers (14 percent) than males who did not have such plans (26 percent were past-month smokers, 10 percent were heavy smokers). This association was negligible among females.

Among MTFP seniors, past-month and heavy smoking were least prevalent among those who felt that religion was very important in their lives and increased uniformly as the self-reported importance of religion lessened. Similarly, adolescent smokers in the 1989 TAPS were more likely to report that they rarely or never attended religious services (54 percent) than were never smokers (29 percent) (Allen et al. 1993).

TAPS also analyzed smoking by dropout status. Respondents who had left school before graduating were more than twice as likely to report smoking in the past week as were those who currently attended or had graduated from high school (43 vs. 17 percent) (CDC 1991a). Female high school students and graduates were about as likely as their male counterparts to have smoked in the past week (17 vs. 18 percent). Female dropouts, however,

Table 5. **Percentage of young people who report frequent or heavy use of cigarettes, by gender, race/Hispanic origin, age/grade, and region, Teenage Attitudes and Practices Survey (TAPS), National Household Surveys on Drug Abuse (NHSDA), Monitoring the Future Project (MTFP), Youth Risk Behavior Survey (YRBS), United States, 1989, 1991, 1992**

Characteristic	1989 TAPS[*]	1991 NHSDA[†]	1992 MTFP[‡,§]	1991 YRBS[∥]
Measure of use	Frequent	Heavy	Heavy	Frequent
Overall	8.1	6.6	10.0	12.7
Gender				
Male	8.4	6.9	10.4	13.0
Female	7.7	6.2	9.2	12.4
Race/Hispanic origin				
White, non-Hispanic	10.1	7.9	12.0	15.4
Male	10.5	8.1	12.2	15.0
Female	9.7	7.6	11.6	15.8
Black, non-Hispanic	1.9	2.8	1.6	3.1
Male	2.8	3.7	2.4	4.5
Female	1.0	1.8	0.9	1.9
Hispanic	4.4	3.0	NA[¶]	6.8
Male	4.0	2.4		8.0
Female	4.9	3.6		5.7
Age/grade				
12–14 years	1.8	1.2		
15–16 years	8.3	6.5		
17–18 years	16.7	14.4		
8th grade			2.9	
9th grade				8.4
10th grade			6.0	11.3
11th grade				15.6
12th grade			10.0	15.6
Region				
Northeast	8.7	7.7	11.1	12.1
North Central	9.1	7.1	10.9	18.9
South	7.3	6.2	10.2	10.5
West	7.6	5.7	6.8	9.0

Sources: **1989 TAPS:** Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (OSH) (unpublished data); **1991 NHSDA:** CDC, OSH (unpublished data); **1992 MTFP:** Johnston, O'Malley, Bachman (in press); Institute for Social Research, University of Michigan (unpublished data); **1991 YRBS:** CDC (1992c); CDC, Division of Adolescent and School Health (unpublished data).

[*] 1989 TAPS, aged 12–18 years. Based on responses to the questions, "Have you ever smoked a cigarette?" and "Think about the last 30 days. On how many of these days did you smoke?" Those who had smoked on 20 or more of the previous 30 days were classified as frequent smokers.

[†] 1991 NHSDA, aged 12–18 years. Based on response to the question, "How many cigarettes have you smoked per day, on the average, during the past 30 days?" Respondents who reported smoking about one-half pack a day (6–15 cigarettes) or more were classified as heavy smokers.

[‡] 1992 MTFP survey. Based on response to the question, "How frequently have you smoked cigarettes during the last 30 days?" Respondents who reported smoking about one-half pack per day or more were classified as heavy smokers.

[§] With the exception of data for 8th- and 10th-grade students, all other data points for the MTFP survey reflect estimates for high school seniors.

[∥] 1991 YRBS, grades 9–12. Based on response to the question, "During the past 30 days, on how many days did you smoke cigarettes?" Those who had smoked on 20 or more of the previous 30 days were classified as frequent smokers.

[¶] NA = Not available.

Table 6. Prevalence (%) of cigarette smoking among high school seniors, by various sociodemographic risk factors, Monitoring the Future Project, United States, 1985–1989

Sociodemographic risk factor	N (weighted)	Smoked during past month	Smoked ≥ 10 cigarettes/day
Household structure			
Lives with both parents	58,100	28.3	10.3
Lives with father only	2,657	35.4	16.3
Lives with mother only	13,955	29.5	12.2
Lives alone	547	47.2	28.3
Other	5,783	34.4	17.8
Population density of locale in which respondent grew up			
Farm	4,445	32.5	12.3
Country	9,438	30.8	12.4
Small city	23,837	28.9	11.0
Medium-sized city or suburb	16,096	29.3	10.9
Large city or suburb	12,504	28.3	10.8
Very large city or suburb	7,612	25.9	8.9
Self-reported overall academic performance			
Above average	24,640	21.6	6.6
Slightly above average	18,688	28.0	9.7
Average	28,609	34.0	14.2
Below average	5,652	40.6	20.7
Plans to complete four years of college	50,364	23.9	6.9
Does not plan to complete four years of college	25,379	39.1	19.5
Plans to enter the armed forces			
Male	8,317	31.2	13.7
Female	2,644	30.4	12.3
Does not plan to enter the armed forces			
Male	25,621	26.1	10.0
Female	34,669	30.1	11.0
Importance of religion			
Very important	20,637	19.2	5.9
Important	25,166	29.5	10.5
Not/somewhat important	33,104	35.1	15.2

Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

were less likely to have smoked than male dropouts (33 vs. 52 percent). White high school students and graduates were more likely than their black counterparts to have smoked in the past week (19 vs. 6 percent). White dropouts were also more likely to have smoked than were black dropouts (46 vs. 17 percent). Data on past-month smoking for 16- through 18-year-old high school seniors and similar-aged youth who reported that they had dropped out of school are available from the NHSDA (Kopstein and Roth 1993). About 28 percent of white students and 72 percent of white dropouts were past-month smokers, and 7 percent of black students and 30 percent of black dropouts were past-month smokers. Among Hispanic 16- through 18-year-olds, however, past-month smoking prevalence was less divergent between students (25 percent) and dropouts (27 percent). Pirie, Murray, and Luepker (1988), using surveys conducted in Minnesota, also reported a higher prevalence of smoking among dropouts.

Age or Grade When Smoking Begins

Smoking initiation at a young age increases the subsequent risk of heavy smoking (Escobedo et al. 1993; Taioli and Wynder 1991) and of smoking-attributable mortality (USDHHS 1989b). As is discussed in detail in Chapter 4 (see "Developmental Stages of Smoking"), smoking initiation is a complex process that can occur over a number of years. The present analysis examined two points in this process: the age a person first tries a cigarette, and the age a person begins smoking daily.

Because some initiation occurs after the adolescent years, the analysis began with self-reported data recalled by adults in the 1991 NHSDA (Table 7). The analysis was further restricted to adults aged 30 through 39 because virtually all initiation occurs before the age of 30 (CDC 1991b; SAMHSA, unpublished data) and because virtually all of the increased mortality that results from cigarette smoking occurs after the age of 40 (National Center for Health Statistics [NCHS] 1992a;

Table 7. Cumulative percentages of recalled age at which a respondent first tried a cigarette and began smoking daily, among persons aged 30–39, National Household Surveys on Drug Abuse, United States, 1991

	All persons*		Persons who had ever tried a cigarette	Persons who had ever smoked daily	
Age (years)	First tried a cigarette	Began smoking daily	First tried a cigarette	First tried a cigarette	Began smoking daily
< 12	14.1	0.9	18.0	15.6	1.9
< 14	29.7	3.9	38.0	36.7	8.0
< 16	48.2	12.2	61.9	62.2	24.9
< 18	63.7	26.0	81.6	81.9	53.0
≤ 18	68.8	34.9	88.2	89.0	71.2
< 20	71.0	37.8	91.0	91.3	77.0
< 25	76.6	46.5	98.2	98.4	94.8
< 30	77.4	48.1	99.3	99.4	98.1
≤ 39	78.0	49.0	100.0	100.0	100.0
Never smoked	100.0	100.0	NA†	NA	NA
Mean age	NA	NA	14.5	14.6	17.7

Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

*All persons (N = 6,388).

†NA = Not applicable.

Table 8. **Age or grade when respondents first tried a cigarette, Teenage Attitudes and Practices Survey (TAPS), National Household Surveys on Drug Abuse (NHSDA), Monitoring the Future Project (MTFP), Youth Risk Behavior Survey (YRBS), United States, 1989, 1991**

Age/grade[*]	TAPS[†] %	NHSDA[‡] %	MTFP[§] %	YRBS[‖] %
≤ 12 years/≤ grade 6	10.1	25.2	18.5	19.2
13–14 years/grades 7–8	11.4	14.5	21.6	17.7
15–16 years/grades 9–10	22.0	16.6	14.9	15.9
> 16 years/> grade 10	8.2	3.9	5.3	5.7
Never smoked	48.3	39.9	39.8	41.4

Sources: **1989 TAPS:** Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (OSH) (unpublished data); **1991 NHSDA**: CDC, OSH (unpublished data); **1991 MTFP**: Institute for Social Research, University of Michigan (unpublished data); **1991 YRBS**: CDC, Division of Adolescent and School Health (unpublished data).

[*] In TAPS, the NHSDA, and the YRBS, respondents reported the age at which they had first smoked; in the MTFP, respondents reported the grade in which they first smoked.

[†] Includes 17- and 18-year-old respondents to the 1989 TAPS who had completed the 11th grade and who still attended school. Response categories were constructed using the questions, "Have you ever smoked a cigarette?" and "How old were you when you smoked your first whole cigarette?"(N = 687).

[‡] Includes respondents to the 1991 NHSDA between the ages of 17 and 18 years who had completed the 11th grade and responded to the question, "About how old were you when you first tried a cigarette?" (N = 979).

[§] Includes high school senior respondents to the 1991 MTFP survey who responded to the question, "When if ever did you first do each of the following things . . . Smoke your first cigarette?" (N [weighted] = 2,012).

[‖] Includes 12th-grade respondents to the 1991 YRBS who responded to the question, "How old were you when you smoked a whole cigarette for the first time?" (N = 3,127).

Table 9. **Age or grade when respondents began smoking daily, National Household Surveys on Drug Abuse (NHSDA), Monitoring the Future Project (MTFP), Youth Risk Behavior Survey (YRBS), United States, 1991**

Age/grade[*]	NHSDA[†] %	MTFP[‡] %	YRBS[§] %
≤ 12 years/≤ grade 6	3.3	2.3	3.3
13–14 years/grades 7–8	4.0	8.5	6.1
15–16 years/grades 9–10	10.4	11.9	10.2
> 16 years/> grade 10	4.6	6.0	4.5
Never smoked daily	77.5	71.2	76.0

Sources: **1991 NHSDA**: Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (unpublished data); **1991 MTFP**: Institute for Social Research, University of Michigan (unpublished data); **1991 YRBS**: CDC, Division of Adolescent and School Health (unpublished data).

[*] In the NHSDA and the YRBS, respondents reported the age at which they had begun smoking daily; in the MTFP, respondents reported the grade in which they had begun smoking daily.

[†] Includes 17- and 18-year-old respondents to the 1991 NHSDA who had completed the 11th grade who responded to the question, "About how old were you when you first started smoking daily?" (N = 959).

[‡] Includes high school senior respondents to the 1991 MTFP survey who responded to the question, "When, if ever, did you first do each of the following things . . . Smoke cigarettes on a daily basis?" (N [wtd.] = 2,074).

[§] Includes 12th-grade respondents to the 1991 YRBS who responded to the question, "How old were you when you first started smoking cigarettes regularly? (at least one cigarette every day for 30 days)" (N = 3,074).

USDHHS 1989b). Since the recalled age at initiation is often 10 or more years younger than the age of the respondent at the time of the survey, recall bias may affect the reliability of these estimates.

In the 1991 NHSDA, 69 percent of respondents aged 30 through 39 years reported trying a cigarette by age 18. Of all persons who had ever tried a cigarette, 88 percent had tried their first cigarette by age 18. The mean age of first trying a cigarette was 14.5 years. Thirty-five percent of the respondents had become daily smokers by age 18. Of those who had ever smoked daily, 71 percent had smoked daily by age 18. The mean age of becoming a daily smoker was 17.7 years.

Surveys conducted in 1991 among school-aged students, while lacking information on postadolescent initiation, provide information of more recent initiation patterns (i.e., during the 1980s and early 1990s). Among 12th-grade students surveyed in 1991, 22 percent of TAPS respondents, 40 percent of NHSDA respondents, 40 percent of MTFP respondents, and 37 percent of YRBS respondents first tried a cigarette by age 14 (Table 8). About 60 percent of the respondents in the NHSDA, the MTFP, and the YRBS and about 50 percent of the TAPS respondents had smoked by their senior year. Daily cigarette use began by age 16 (or the 10th grade) for 18 to 23 percent of respondents to the NHSDA, the MTFP, and the YRBS (Table 9). By their senior year, 22 to 29 percent of these respondents had become daily smokers.

Other Patterns of Smoking

Two of the surveys gathered further information about smoking patterns—the number of days per month an adolescent smoked and the number of cigarettes the adolescent smoked per day. In the 1991 YRBS, responses indicated that in general, the greater number of days students reported smoking during the 30 days preceding the survey, the greater the number of cigarettes they smoked per day (Table 10). For example, 49 percent of students who smoked cigarettes on only one or two days during the preceding 30 days smoked fewer than one cigarette per day; among students who smoked cigarettes on all 30 days, 47 percent smoked 11 or more per day.

Smoking patterns were also reported recently by Moss et al. (1992), using 1989 TAPS data (Table 11). About 41 percent of teenage smokers—whether male or female—smoked every day, and about one in four smoked on fewer than five of the preceding 30 days. The percentage of smokers who smoked every day increased with increasing age; 48 percent of 16- through 18-year-old smokers smoked every day. About twice as many white as black teenagers smoked every day (42 vs. 22 percent), and blacks were more likely than whites to have smoked on fewer than five days. Non-Hispanics were more likely than Hispanics to smoke every day.

Sixteen percent of 12- through 18-year-old TAPS respondents who smoked during the week preceding the survey smoked 20 or more cigarettes daily. Males smoked more cigarettes daily than females. Older students smoked more cigarettes daily than younger students; 47 percent of 16- through 18-year-old smokers and 11 percent of 12- and 13-year-old smokers reported smoking 10 or more cigarettes daily. Whites smoked more cigarettes daily than blacks, and non-Hispanics

Table 10. Percent distribution of the number of cigarettes smoked per day, by the number of days on which cigarettes were smoked during the 30 days preceding the survey, Youth Risk Behavior Survey, United States, 1991

Number of days cigarettes were smoked	Cigarettes smoked per day							
	< 1	1	2–5	6–10	11–20	> 20	Total	N
1–2	49.2	29.2	18.0	1.7	1.0	0.2	100	756
3–5	25.3	29.2	41.5	3.6	0.4	0.0	100	452
6–9	7.0	32.5	54.4	5.8	0.4	0.0	100	273
10–19	7.4	13.0	66.5	10.8	1.8	0.4	100	326
20–29	0.7	4.6	61.4	27.9	5.4	0.0	100	294
30	0.1	0.3	26.5	26.0	36.6	10.8	100	803
Average	14.8	15.0	37.2	14.8	14.1	4.0	100	2,904

Source: Centers for Disease Control and Prevention, Division of Adolescent and School Health (unpublished data).

Table 11. Percentage of current smokers by the number of days smoked during the past month and the average number of cigarettes smoked daily, by gender, age, and race/Hispanic origin, Teenage Attitudes and Practices Survey, United States, 1989

	Number of days smoked during past month[*]				Number of cigarettes smoked daily[†]			
Category	**< 5**	**5–9**	**10–29**	**Every day**	**< 5**	**5–9**	**10–19**	**≥ 20**
Overall	24.1	8.7	26.4	40.8	37.9	20.4	25.7	16.0
Gender								
Male	23.9	8.5	26.6	41.0	33.9	19.3	27.6	19.2
Female	24.3	8.9	26.2	40.6	42.7	21.6	23.5	12.1
Age (years)								
12–13	51.9	8.3[‡]	23.3	16.5[‡]	64.3	24.6[‡]	11.0[‡]	0.0
14–15	28.4	9.8	34.5	27.3	55.5	17.2	23.0	4.3[‡]
16–18	20.0	8.4	24.1	47.5	31.6	21.1	27.2	20.1
Race								
White	23.4	8.4	26.2	42.0	36.6	20.1	26.5	16.8
Black	37.0	15.0[‡]	26.5	21.6	60.3	20.5[‡]	16.3[‡]	2.9[‡]
Hispanic origin								
Hispanic	30.7	11.2[‡]	31.9	26.3	59.2	22.5	11.6[‡]	6.6[‡]
Non-Hispanic	23.5	8.5	26.0	42.0	36.3	20.2	26.9	16.7

Source: Moss et al. (1992).

[*] Excludes unknown number of days smoked.

[†] Excludes unknown number of cigarettes smoked daily and none smoked during the past week.

[‡] Estimate does not meet standards of reliability or precision (< 30 percent relative standard error).

were heavier smokers than Hispanics. Thus, not only were black and Hispanic adolescents less likely to smoke than whites, but those who did smoke, smoked fewer cigarettes each day than their white adolescent counterparts.

On average, persons 12 through 18 years old who smoked the week before the survey (N = 1,099) smoked 9 cigarettes each day. Males smoked 10 cigarettes daily and females smoked 8. Whites averaged 9 cigarettes per day and blacks averaged 6 (1989 TAPS, CDC, Office on Smoking and Health [OSH], unpublished data). The overall average for adult smokers is 19 cigarettes a day (CDC 1992a).

Initiation Continuum of Smoking

The 1989 Surgeon General's report on smoking and health described the continuum of smoking behavior as one that occurs in four stages: initiation, experimentation, regular smoking, and dependence or addiction (USDHHS 1989b). The report also acknowledged a preparatory stage that occurred before any initial smoking (Flay et al. 1983). These five stages are examined in detail in Chapter 4 (see "Developmental Stages of Smoking").

Data from the 1989 TAPS were used to create an initiation continuum similar to the smoking continuum for adults that was described in the 1989 Surgeon General's report (Pierce and Hatziandreu 1990; USDHHS 1989b). This initiation continuum incorporates measures of smoking behavior and measures of the possibility that a respondent will smoke in the future. In 1989, 54.5 percent of persons 12 through 18 years old reported that they had never smoked a cigarette, not even a few puffs (Table 12). These respondents were asked to report (1) whether they thought they would try a cigarette soon ("yes," "no," and "don't know"), (2) whether they would

Table 12. Percent distribution of an initiation continuum for cigarette smoking among persons aged 12–18 years, by age, gender, and race/Hispanic origin, Teenage Attitudes and Practices Survey, United States, 1989

		Age (years)				Gender		Race/Hispanic origin		
	Uptake continuum category	Overall	12–14	15–16	17–18	Male	Female	White/ non-His- panic	Black/ non-His- panic	Hispanic
1.	Never tried smoking, not susceptible	44.3	55.5	40.1	32.9	42.0	46.8	42.3	54.0	40.3
2.	Never tried smoking, susceptible	10.2	15.8	8.4	4.3	10.1	10.3	9.4	10.5	15.9
3.	Tried smoking, not a whole cigarette, not susceptible	7.9	6.6	8.3	9.5	8.6	7.2	7.1	12.7	8.0
4.	Tried smoking, not a whole cigarette, susceptible	3.3	4.3	3.2	2.1	3.8	2.7	2.6	5.2	5.4
5.	Smoked 1–99 cigarettes, but none in the last 30 days, and not intending to smoke in a year	13.5	7.5	16.6	18.8	13.6	13.4	14.6	9.6	12.6
6.	Smoked 1–99 cigarettes, but none in the last 30 days, and might smoke in a year	4.1	4.2	4.8	3.1	4.2	3.9	4.4	1.9	5.4
7.	Smoked ≥ 100 cigarettes, but none in the last 30 days, and not intending to smoke in a year	0.9	0.2	1.0	1.9	1.2	0.7	1.2	0.0	0.8
8.	Smoked ≥ 100 cigarettes, but none in the last 30 days, and might smoke in a year	0.4	0.2	0.4	0.7	0.4	0.4	0.5	0.3	0.5
9.	Smoked 1–99 cigarettes, at least some in the past 30 days	5.9	3.7	7.3	7.4	5.8	5.9	6.3	4.1	5.6
10.	Smoked ≥ 100 cigarettes and smoked on 1–19 days during the past 30 days	2.2	0.7	2.6	3.8	2.3	2.0	2.6	0.6	1.7
11.	Smoked at least 100 cigarettes and smoked on at least 20 days during the past 30 days	7.3	1.3	7.5	15.5	7.8	6.7	9.1	1.2	4.0

Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

smoke a cigarette if one of their best friends were to offer them one ("definitely yes," "probably yes," "probably not," "definitely not," and "don't know"), and (3) whether they thought they would be smoking cigarettes in one year ("definitely yes," "probably yes," "probably not," "definitely not," and "don't know"). Never smokers who answered "no" to the first question, "definitely not" to the second question, and "definitely not" to the third question were categorized as "not susceptible" to smoking. Those who answered these three questions in any other way were considered susceptible to smoking in the future (Pierce et al. 1993). According to these criteria, 44 percent of all TAPS respondents had never tried a cigarette and were not considered susceptible to smoking, and 10 percent had never tried smoking but were considered susceptible.

Adolescents who had tried smoking but had not smoked a whole cigarette accounted for 11 percent of TAPS respondents; 8 percent were judged to be not susceptible to smoking in the future, and 3 percent were judged susceptible. Those who had smoked at least one cigarette were only asked question 3, above, concerning whether or not they thought they would be smoking in a year. A large category (14 percent of all respondents) was composed of those who had smoked at least 1 but fewer than 100 cigarettes, who had not smoked in the preceding 30 days, and who definitely did not intend to smoke in a year. Another 4 percent had smoked from 1 to 99 cigarettes, had not smoked in the preceding 30 days, and were not definite in their resolve to not be smoking in a year. Slightly more than 1 percent of TAPS respondents had smoked at least 100 cigarettes but had not smoked in the preceding 30 days; these respondents are considered to be former smokers (USDHHS 1989b, 1990b).

Finally, among the 15 percent of respondents who smoked in the preceding 30 days, about 45 percent (6 percent of all respondents) had smoked fewer than 100 cigarettes in their lifetime. Although current smokers, these persons were still at a relatively early stage in the process of smoking initiation. Among those who had smoked at least 100 cigarettes and had smoked in the preceding month, more than three-fourths (7 percent of all respondents) had smoked on 20 or more of those 30 days.

The distribution of this continuum was similar for males and females. White adolescents were more likely to be further along the continuum than were Hispanic and black adolescents.

Cigarette Brand Preference

Knowing what brands of cigarettes are preferred by young smokers may aid the development of smoking prevention programs and may provide insight into the influence that cigarette advertising may have on young people.

In 1978–1980, the NHIS assessed the brands of cigarettes most often used by current smokers (CDC, OSH, unpublished data). Among 707 respondents who were 18 or 19 years old, the most commonly used brands were Marlboro (37 percent), Kool (14 percent), Salem (10 percent), Winston (9 percent), Newport (8 percent), Virginia Slims (5 percent), Merit (4 percent), Benson & Hedges (3 percent), and Camel (2 percent). Ten percent of females and no males used Virginia Slims. Among whites, Marlboro (42 percent), Kool (10 percent), Winston (10 percent), Salem (8 percent), Virginia Slims (6 percent), and Newport (6 percent) were the most commonly used brands. Among blacks, Kool (46 percent), Newport (25 percent), Salem (20 percent), and Benson & Hedges (6 percent) were the most commonly smoked brands.

In the 1989 TAPS, adolescent respondents who generally bought their own cigarettes were asked what brand they usually purchased. More than two-thirds of these smokers usually purchased Marlboro (Table 13). Preference for Marlboro did not differ appreciably by gender, Hispanic origin, age, or region of the country. White adolescent smokers were much more likely to smoke Marlboro cigarettes than were black adolescent smokers (71 vs. 9 percent).

The next most popular brands, Newport and Camel, each accounted for only 8 percent of the overall population's preference. Black smokers, however, were much more likely to smoke Newport cigarettes than were white smokers (61 vs. 6 percent), although sample sizes of blacks were small. Smokers who resided in the Northeast and the Midwest were more likely to smoke Newport cigarettes than were smokers in the South and the West. Among white adolescents, Newport was more popular in the Northeast (14 percent) and the Midwest (7 percent) than in the South (1 percent) and the West (1 percent) (CDC 1992b). The Camel brand was more popular among male (11 percent) than female smokers (5 percent), among white (8 percent) than black smokers (3 percent), and among smokers residing in the West (18 percent) than among those residing in the other three regions (from 4 to 7 percent).

Several nonnational studies conducted since the 1989 TAPS suggest that Camel cigarettes may be gaining in popularity among young smokers. In a 1990 survey of ninth-grade students in 10 U.S. communities included in the Community Intervention Trial for Smoking Cessation (COMMIT) evaluation, 43 percent of smokers who usually bought their own cigarettes bought Marlboro, 30 percent bought Camel, and 20 percent bought Newport (CDC 1992b). As TAPS data also indicated, adolescent smokers residing in communities in the western

Table 13. Percent distribution of cigarette brands that 12–18-year-old current smokers* reported usually buying, by gender, race/Hispanic origin,† age, and region, Teenage Attitudes and Practices Survey, United States, 1989

Category	Number	Marlboro	Newport	Camel	Winston	Benson & Hedges	Salem	Kool	Merit	Vantage	Other
Overall‡	865	68.7	8.2	8.1	3.2	1.5	1.4	1.0	0.5	0.1	7.3
Gender											
Male	477	68.9	7.3	10.9	3.6	0.5	0.2	1.9	0.7	0.2	6.0
Female	388	68.4	9.4	4.6	2.6	2.9	2.9	0.0	0.3	0.0	8.9
Race											
White	807	71.4	5.6	8.4	3.4	1.0	1.3	0.6	0.5	0.1	7.6
Black	41	8.7	61.3	3.1	0.0	9.7	3.3	10.9	0.0	0.0	2.9
Hispanic origin											
Hispanic	46	60.9	12.8	7.6	0.0	2.8	3.7	5.8	0.0	0.0	6.5
Non-Hispanic	817	69.1	8.0	8.1	3.3	1.5	1.3	0.8	0.5	0.1	7.3
Age (years)											
12–15	195	74.8	6.1	8.7	2.5	0.9	0.4	1.1	0.0	0.0	6.5
16–18	670	67.0	8.8	7.9	3.3	1.7	1.6	1.0	0.6	0.1	7.8
Region											
Northeast	184	68.4	16.2	4.1	0.0	2.3	0.0	0.0	0.6	0.5	7.9
Midwest	247	70.2	10.0	7.3	3.4	2.2	0.0	1.1	0.5	0.0	5.3
South	281	67.2	5.0	6.1	6.2	1.1	2.9	2.1	0.4	0.0	9.1
West	153	69.6	2.0	18.1	0.7	0.6	2.3	0.0	0.6	0.0	6.2
Overall market share, 1989		26.3	4.7	3.9	9.1	6.2	3.9	5.9	3.8	2.5	33.7

Sources: Centers for Disease Control (1992b); Maxwell (1992).

*Persons who reported smoking on one or more of the 30 days preceding the survey.

†Excludes the racial category "other" (N = 17). Ethnicity for two persons was unknown.

‡Data were weighted to provide national estimates.

United States showed more preference for Camel cigarettes than did smokers from other regions of the nation. Other studies conducted after TAPS report rates of Camel preference among adolescent smokers that are consistent with the COMMIT survey results (DiFranza et al. 1991; Pierce, Gilpin, et al. 1991).

In June and July 1992, the George H. Gallup International Institute (1992) conducted a telephone survey of a nationwide sample of 1,125 youths 12 through 17 years old. Smokers (those who reported having smoked at least one cigarette during the 30 days preceding the interview) were disproportionately oversampled, and the data were weighted to represent the adolescent population. Smokers were asked, "Thinking now about the last time you bought cigarettes for yourself, what brand did you happen to buy on that occasion?" Marlboro was the brand bought by 53 percent of these teenage smokers, Camel by 16 percent, and Newport by 8 percent. The most popular brand among blacks in this survey was Newport (54 percent preference).

Trends in Cigarette Smoking

Ever Smoking

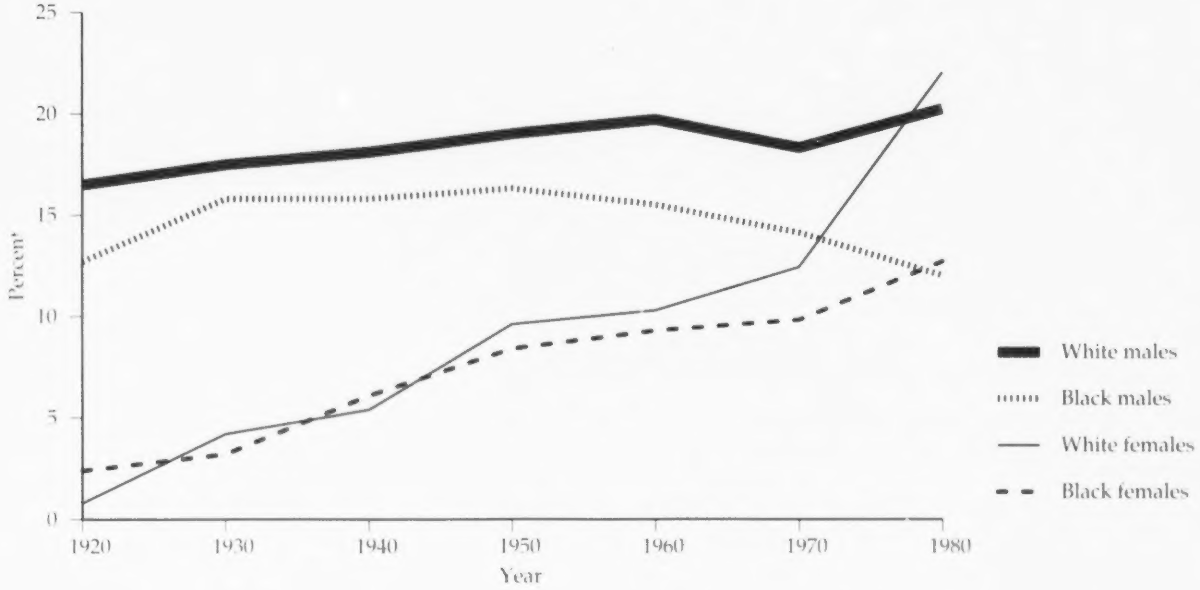
Data from the NTTS, the NHSDA, and the MTFP suggest that the prevalence of ever smoking among adolescents has declined since the 1970s (Table 14). In the NHSDA, the prevalence of smoking among youths 17 through 19 years old declined from 78 percent in 1979 to 64 percent in 1991, an average decline of 1.2 percentage points per year. In the MTFP, the prevalence among 17- and 18-year-olds decreased from 76 percent in 1977 to 62 percent in 1992, an average decline of 0.9 percentage points per year. In the NHIS, the percentage of 18- and 19-year-olds who had smoked at least 100 cigarettes dropped from 41 percent in 1974 to 25 percent in 1991, an average decline of 1.0 percentage points each year.

Current Smoking

NHIS data have been used to examine historical trends in smoking by reconstructing the prevalence of cigarette smoking for the decades in this century before systematic surveillance of cigarette smoking was conducted (USDHHS 1980, 1985, 1991b; Harris 1983). Using information on a respondent's date of birth, age at initiation of fairly regular smoking, and duration of abstinence (for former smokers), the smoking status of the respondent can be assessed for any given year. For this report, the reconstructed prevalence of smoking among those aged 10 through 19 years is reported for the years 1920 through 1980.

Except for 1980, smoking during this 60-year period was more common among white and black adolescent males than among white and black adolescent females (Figure 1). The prevalence of cigarette smoking

Figure 1. **Trends in the reconstructed prevalence* of cigarette smoking among 10–19-year-olds, by gender and race, United States, 1920–1980**



Source: U.S. Department of Health and Human Services (1991b). Data sources are the 1970, 1978, 1979, 1980, and 1987 National Health Interview Surveys.

*The smoking prevalence for each of the years indicated was calculated for people who would have been 10–19 years old in each of those years by using the survey respondents' date of birth, age when they first began smoking regularly, and age when they quit smoking (see Appendix 2).

Table 14. Trends in the prevalence (%) of ever smoking among young people, National Teenage Tobacco Surveys (NTTS), National Household Surveys on Drug Abuse (NHSDA), Monitoring the Future Project (MTFP), National Health Interview Surveys (NHIS), United States, 1968–1992

Year	NTTS[*]	NHSDA[†]	MTFP[‡]	NHIS[§]
1968	36.1			
1970	40.8			
1972	39.2			
1974	41.3	69.5		41.1
1976		64.1	75.4	
1977		67.8	75.8	
1978			75.3	36.7
1979	34.0	78.1	74.0	39.3
1980			71.0	34.1
1981			71.0	
1982		72.6	70.1	
1983			70.6	34.5
1984			69.7	
1985		63.2	68.8	29.8
1986			67.6	
1987			67.2	26.2
1988		66.2	66.4	27.7
1989			65.7	
1990		61.4	64.4	27.6
1991		63.6	63.1	25.3
1992			61.8	

Sources: **NTTS**: U.S. Department of Health, Education, and Welfare (USDHEW) (1972, 1976, 1979b); **NHSDA**: Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (OSH) (unpublished data on 1974–1991 surveys); **MTFP**: Johnston, O'Malley, Bachman (in press); **NHIS**: CDC, OSH (unpublished data on 1974–1991 surveys).

[*] NTTS, aged 17–18 years. Published reports (USDHEW 1972, 1976, 1979b) merge never smokers and experimenters (those who tried or experimented with smoking, but who had not yet smoked 100 cigarettes) into one category. By definition, therefore, the NTTS will underestimate the percentage of ever smokers. The trends, however, use the same definition.

[†] NHSDA, aged 17–19 years. Those who reported in 1974, 1976, and 1977 that they were current smokers and those who were not current smokers but who responded "yes" to the question, "Have you ever smoked cigarettes?" were classified as ever smokers for those years. For the years 1979 through 1991, ever smoking status was determined by response to the question, "About how old were you when you first tried a cigarette?" The prevalence of ever smoking is the complement of the response "Never tried a cigarette."

[‡] MTFP high school seniors, aged 17–18 years. Based on response to the question, "Have you ever smoked cigarettes?"

[§] NHIS, aged 18–19 years. Based on response to the question, "Have you smoked at least 100 cigarettes in your entire life?" Those who had smoked at least 100 cigarettes by the time of the survey were classified as ever smokers.

[∥] Available information from published sources (USDHEW 1972, 1976, 1979b) do not permit exact comparisons with the 1989 TAPS data.

remained higher among white adolescent males than among black adolescent males. Smoking prevalence gradually increased among white males during the six decades covered by the data. Among black males, prevalence declined between 1950 and 1980.

Among female adolescents, the reconstructed prevalence of current smoking increased steadily from 1920 through 1980; in 1980, the prevalence among females surpassed that among males for the first time during the six-decade study period. Prevalence among white females has been higher than among black females since 1950. The data indicate a sharp increase in female smoking prevalence between 1970 and 1980.

Trends in current smoking prevalence over the past two decades indicate that for both males and females, past-month smoking declined sharply in the late 1970s or early 1980s (Table 15). Progress then slowed considerably, especially for males. In the MTFP surveys, the past-month smoking prevalence among males actually increased from 27 percent in 1981 to 29 percent in 1992; in the NHSDA and the NHIS, male smoking prevalence was about the same in 1985 and in 1991. The prevalence among adolescent females in the MTFP and NHIS surveys was only slightly lower in 1991 and 1992 than in 1985; in the 1991 NHSDA, female smoking prevalence was about the same as in 1985. By the early 1980s, smoking was generally more common among females than among males. By 1991, however, adolescent females and males had almost equivalent smoking prevalence.

In all three surveys with information on race, the prevalence of current smoking declined during the late 1970s or early 1980s for both black and white older adolescents (Table 16). In the middle 1970s, current smoking was almost equally common among blacks and whites. At the end of that decade, black adolescents were less likely to be current smokers than white adolescents; this trend continued during the 1980s. Among white high school seniors in the MTFP, current smoking was more prevalent in 1992 (32 percent) than in 1981 (30 percent). In all three surveys, prevalence among older white adolescents was slightly higher in 1991 and 1992 than it was in 1985.

Wallace and Bachman (1991) reported that white high school seniors were more than twice as likely as black high school seniors to report smoking in the past month, even after statistical control was made for factors such as parental education, number of parents living at home, urban or rural location, educational plans, academic performance, and religious attitudes and practices.

MTFP trend data are available for daily smoking among racial and ethnic subgroups (Bachman et al. 1991). In general, for Asian, black, white, Hispanic, and American Indian male and female high school seniors, the prevalence of daily smoking declined from 1976–1984. The decline continued at a reduced rate during the late 1980s for most groups and ceased altogether among white males.

Overall, the prevalence of daily smoking among high school seniors was 29 percent in 1976, 21 percent in 1980, and 17 percent in 1992. Among males, the prevalence was 28 percent in 1976, 19 percent in 1980, and 17 percent in 1992; among females, 29 percent smoked daily in 1976, 24 percent in 1980, and 17 percent in 1992. Among whites, the prevalence of daily smoking declined from 29 percent in 1976 to 22 percent in 1980; the prevalence was 20 percent in 1992. Among blacks, the prevalence of daily smoking declined from 27 percent in 1976 to 16 percent in 1980 and continued to decline to 4 percent in 1992 (Bachman, Johnston, O'Malley 1980a, 1981; ISR, University of Michigan, unpublished data).

Data on smoking among the nation's high school seniors have also been reported as a function of parental education (NCHS 1993). Interestingly, the prevalence of past-month smoking decreased slightly from 1980 through 1991 among those seniors whose parents had completed fewer years of formal education and increased slightly during that period among those seniors whose parents had relatively more years of formal education. For example, among those seniors whose parents, on average, did not graduate from high school, the prevalence of past-month smoking decreased from 33 percent in 1980 to 31 percent in 1991; among seniors whose parents graduated from high school, prevalence of smoking was 34 percent in 1980 and 29 percent in 1991. Among seniors whose parents had some postgraduate education, the prevalence of smoking was 24 percent in 1980 and 27 percent in 1991.

Age or Grade When Smoking Begins

The age at which people become regular cigarette smokers has been measured in national surveys conducted in 1955, 1966, 1970, 1978, 1979, 1980, 1987, and 1988 (Haenszel, Shimkin, Miller 1955; NCHS 1970; USDHHS 1980, 1989b, 1991b; CDC 1991b). Data from the 1955 Current Population Survey (Haenszel, Shimkin, Miller 1955) suggest that during the first half of the century, people became regular smokers at progressively younger ages. The data for males are limited, however, because before 1974 many of the reports for men were provided by proxy respondents.

To reduce proxy responses, Ahmed and Gleeson (NCHS 1970) limited their analysis of data from the 1966 Current Population Survey to females. These investigators concluded that between 1955 and 1966, U. S. women began smoking at an earlier age.

For the present report, the likelihood of having become a regular cigarette smoker by age 18 was determined for females surveyed in the 1970, 1978–1980, and

Table 15. Trends in the prevalence (%) of current smoking[*] among young people, by gender, National Teenage Tobacco Surveys (NTTS), National Household Surveys on Drug Abuse (NHSDA), Monitoring the Future Project (MTFP), National Health Interview Surveys (NHIS), United States, 1968–1992

Year	NTTS Males (aged 17–18 years)	NTTS Females (aged 17–18 years)	NHSDA Males (aged 17–19 years)	NHSDA Females (aged 17–19 years)	MTFP Males (aged 17–18 years)	MTFP Females (aged 17–18 years)	NHIS Males (aged 18–19 years)	NHIS Females (aged 18–19 years)
1968	34.0	21.0						
1970	37.8	24.1						
1972	31.2	26.0						
1974	32.6	26.4	47.8	38.7			36.9	30.8
1976			35.1	52.0	37.7	39.1		
1977			39.0	47.2	36.7	39.7		
1978					34.5	38.1	30.6	33.5
1979	19.6	27.0	41.7[†]	41.7[†]	31.2	37.1	29.5	34.2
1980					26.8	33.4	24.9	27.8
1981					26.5	31.6		
1982			35.6	37.3	26.8	32.6		
1983					28.0	31.6	23.3	31.4
1984					25.9	31.9		
1985			27.8	26.7	28.2	31.4	20.1	24.5
1986					27.9	30.6		
1987					27.0	31.4	21.6	20.9
1988			28.3	32.9	28.0	28.9	19.6	23.1
1989		[‡]			27.7	29.0		
1990			28.9	20.2	29.1	29.2	21.7	18.0
1991			27.0	27.0	29.0	27.5	22.0	20.6
1992					29.2	26.1		

Sources: **NTTS**: U.S. Department of Health, Education, and Welfare (USDHEW) (1972, 1976, 1979b); **NHSDA**: Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (OSH) (unpublished data on 1974–1991 surveys); **MTFP**: Bachman, Johnston, O'Malley (1980a, b, 1981, 1984, 1985, 1987, 1991); Johnston, Bachman, O'Malley (1980a, b, 1982, 1984, 1986, 1991, 1992); Johnston, O'Malley, Bachman (1991a, in press); Institute for Social Research, University of Michigan (unpublished data); **NHIS**: CDC, OSH (unpublished data in 1974–1991 surveys).

[*] For the NTTS, current smokers are those who state that they smoke less than one cigarette per week, one or more cigarettes per week, or one or more cigarettes a day (USDHEW 1979b). For the NHSDA and the MTFP, current smoking is defined as any cigarette smoking during the 30 days preceding the survey. For the NHIS, current smokers are those who report that they have smoked at least 100 cigarettes and who respond "yes" to the question, "Do you smoke now?"

[†] The 1979 NHSDA determined current smoking status only for those respondents who had smoked at least 100 cigarettes (lifetime). The National Institute on Drug Abuse later published adjusted 1979 estimates using data from the 1982 NHSDA (Miller et al. 1983). The adjusted 1979 estimates used the ratio of the 1982 prevalence estimate, based on the 1979 definition, to the prevalence estimate based on the definition used in other years (i.e., any smoking in the last 30 days, regardless of whether the respondent had ever smoked 100 lifetime cigarettes). This table reports estimates based on the same adjustment procedure.

[‡] Available information from published sources (USDHEW 1972, 1976, 1979b) does not permit exact comparisons with the 1989 TAPS data.

Table 16. Trends in the prevalence (%) of current smoking[*] among white and black young people, National Household Surveys on Drug Abuse (NHSDA), Monitoring the Future Project (MTFP), National Health Interview Surveys (NHIS), United States, 1974–1992

	NHSDA[†]		MTFP		NHIS	
	White	Black	White	Black	White	Black
Year	(aged 17–19 years)		(aged 17–18 years)		(aged 18–19 years)	
1974	41.9	47.4			33.6	33.7
1976	43.0	47.2	38.3	39.7		
1977	42.9	44.3	38.4	34.4		
1978			37.0	31.5	33.3	26.3
1979	44.4[‡]	37.7[‡]	34.9	28.7	32.6	30.8
1980			31.0	25.2	26.1	29.0
1981			30.1	22.3		
1982	39.2	20.9	31.3	21.2		
1983			31.3	21.2	28.6	18.5
1984			31.0	17.6		
1985	28.6	20.8	31.7	18.7	23.4	18.4
1986			32.0	14.6		
1987			32.2	13.9	23.4	15.3
1988	33.0	17.6	32.3	12.8	23.7	9.4
1989			32.1	12.4		
1990	28.3	7.2	32.5	12.0	22.2	10.3
1991	30.5	11.4	31.8	9.4	24.9	7.6
1992			31.8	8.2		

Sources: **NTTS**: U.S. Department of Health, Education, and Welfare (1972, 1976, 1979b); **NHSDA**: Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (OSH) (unpublished data on 1974–1991 surveys); **MTFP**: Bachman, Johnston, O'Malley (1980a, b, 1981, 1984, 1985, 1987, 1991); Johnston, Bachman, O'Malley (1980a, b, 1982, 1984, 1986, 1991, 1992); Johnston, O'Malley, Bachman (1992a); Institute for Social Research, University of Michigan (unpublished data); **NHIS**: CDC, OSH (unpublished data on 1974–1991 surveys).

[*] For the NHSDA and the MTFP, current smoking is defined as any cigarette smoking during the 30 days preceding the survey. For the NHIS, current smokers are those who report that they have smoked at least 100 cigarettes and who respond "yes" to the question, "Do you smoke now?"

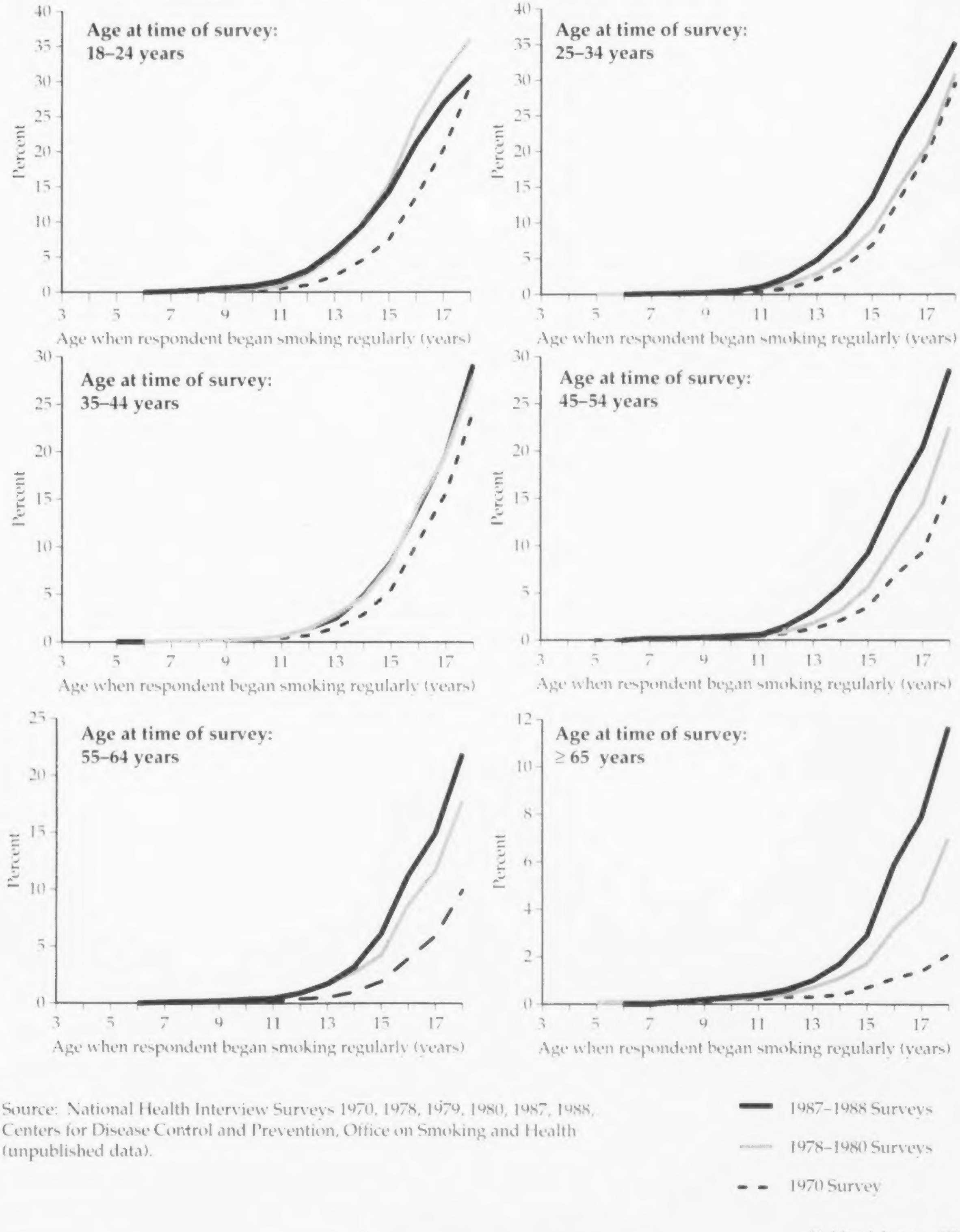
[†] In the NHSDA, "white" and "black" include respondents of Hispanic origin, except for 1985.

[‡] The 1979 NHSDA determined current smoking status only for those respondents who had smoked at least 100 cigarettes (lifetime). The National Institute on Drug Abuse later published adjusted 1979 estimates using data from the 1982 NHSDA (Miller et al. 1983). The adjusted 1979 estimates used the ratio of the 1982 prevalence estimate, based on the 1979 definition, to the prevalence estimate based on the definition used in other years (i.e., any smoking in the last 30 days, regardless of whether the respondent had ever smoked 100 lifetime cigarettes). This table reports estimates based on the same adjustment procedure.

1987–1988 NHIS (Figure 2). The data confirm that women in the United States have started to smoke at increasingly younger ages. The largest differences exist for women who were at least 45 years old at the time of the survey. The initiation curve for 18- through 24-year-old females surveyed in 1987 and 1988 is, by age 18, lower than that for 18- through 24-year-old females surveyed in 1978 through 1980, which is consistent with the notion that the prevalence of cigarette smoking has declined recently among young females (Table 15).

Johnston, O'Malley, and Bachman (1992a) used retrospective reports from MTFP high school seniors to describe trends in the initiation of daily smoking among seniors. Their data show that the likelihood of becoming a daily smoker at an earlier grade level increased sharply during the early to middle 1970s for the 1976 through 1978 senior classes. From 1975 through 1977, this likelihood decreased, and the grade of initiation declined or leveled for the 1979–1986 and 1988 classes. The lifetime

Figure 2. Cumulative percentage of females becoming regular cigarette smokers by age 18, by age at time of survey, United States, 1970, 1978–1980, and 1987–1988



Source: National Health Interview Surveys 1970, 1978, 1979, 1980, 1987, 1988, Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

prevalence of daily cigarette smoking at all grade levels increased among the classes of 1989, 1990, and 1991.

Number of Cigarettes Smoked Each Day

Trends in the intensity of smoking among MTFP high school seniors indicate that since 1976, the proportion of heavy smokers (≥ one-half pack per day) has decreased and the proportion of never smokers has increased (Figure 3). For example, in 1976, 25 percent of high school seniors had never smoked, and 19 percent were heavy smokers; by 1992, 38 percent had never smoked, and 10 percent were heavy smokers (Bachman, Johnston, O'Malley 1980a; ISR, University of Michigan, unpublished data).

Attempts to Quit Smoking

Cessation attempts are common among young smokers. In the 1989 TAPS, 74 percent of 12- through 18-year-old smokers reported that they had seriously thought about quitting, 64 percent reported that they had tried to quit smoking, and 49 percent reported that they had tried to quit during the previous six months (Allen et al. 1993).

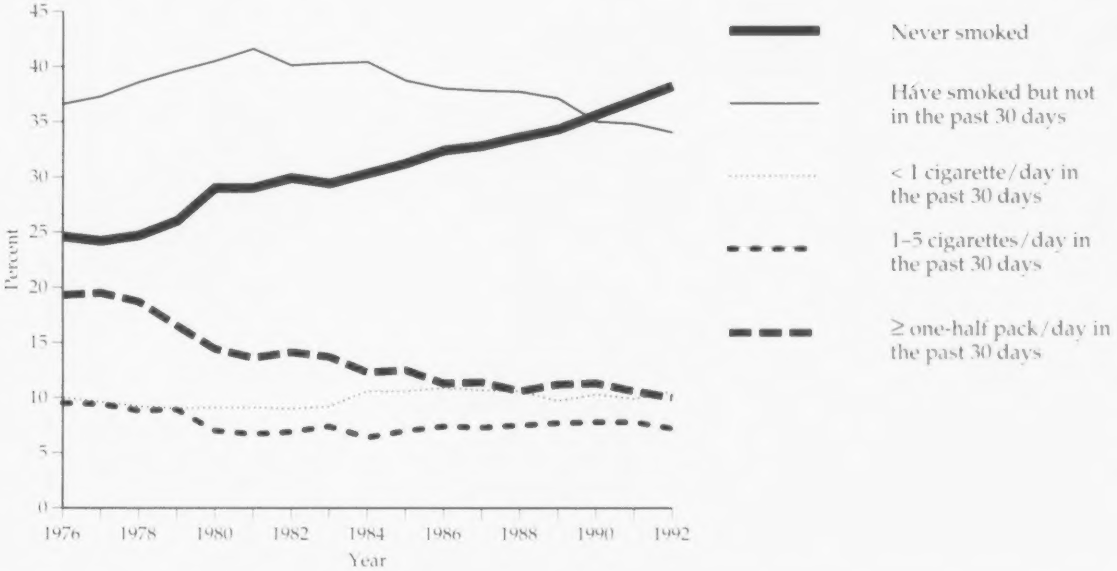
Nearly half of all smokers among high school seniors surveyed by the MTFP between 1976 and 1984 reported that they wanted to stop smoking (Table 17). Interest in quitting declined slightly thereafter. About 30 percent of current smokers reported that at one time in their lives they had tried but failed to stop smoking. About 40 percent of daily smokers reported that they had tried at least once to stop smoking but had failed. The percentage of seniors who at some time had smoked regularly but had not smoked during the 30 days preceding the survey (former smokers) increased sharply for males from 1977 through 1980 and for females from 1977 through 1981 (Figure 4). This measure declined sharply after 1980 for males and after 1981 for females.

Table 17. Trends in high school senior smokers' interest in quitting smoking and attempts to quit smoking, by frequency of smoking during the past 30 days, Monitoring the Future Project, United States, 1976–1989

	Respondents answering "Yes"					
Survey Question	**1976–1979 N (weighted)**	**%**	**1980–1984 N (weighted)**	**%**	**1985–1989 N (weighted)**	**%**
Do you want to stop smoking now?						
Among those who smoked at all during the last 30 days	3,872	46.1	3,805	47.1	3,418	42.5
Among those who smoked ≥ 1 cigarette/day during the last 30 days	3,396	46.1	3,262	47.6	2,761	43.9
Have you ever tried to stop smoking and found that you could not?						
Among those who smoked at all during the last 30 days	4,740	31.5	4,942	31.4	4,534	27.8
Among those who smoked ≥ 1 cigarette/day during the last 30 days	3,604	38.5	3,464	41.6	2,953	39.4

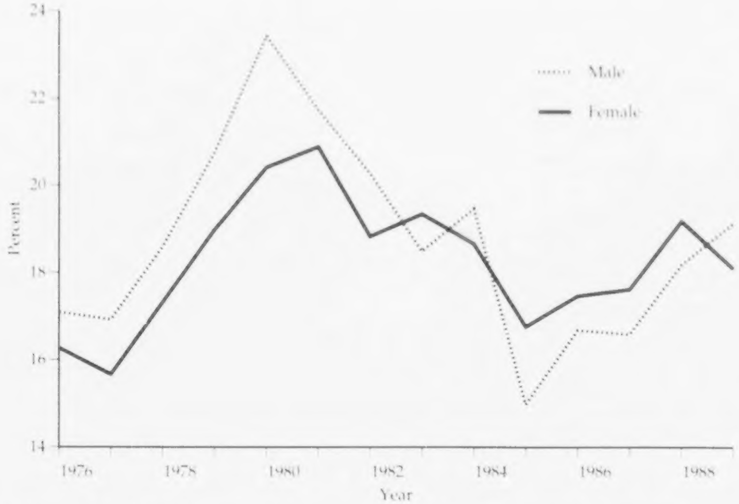
Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

Figure 3. **Trends in the intensity of smoking among high school seniors, Monitoring the Future Project, United States, 1976–1992**



Sources: Bachman, Johnston, O'Malley (1980a, b, 1981, 1984, 1985, 1987, 1991); Johnston, Bachman, O'Malley (1980a, b, 1982, 1984, 1986, 1991, 1992); Institute for Social Research, University of Michigan (unpublished data).

Figure 4. **Trends in the percentage of former smokers among ever smokers,* by gender, high school seniors, Monitoring the Future Project, United States, 1976–1989**



Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).
*Percentage of those who had ever smoked regularly who had not smoked during the previous 30 days.

The trend of cessation is similar to the trend for current smoking prevalence. Substantial progress occurred in the late 1970s, but this progress slowed considerably in the 1980s.

Trends in Knowledge and Attitudes About Smoking

Trends in Perceived Health Risks of Smoking

Data from the MTFP allow comparisons of trends in beliefs about the risks associated with cigarette smoking and in actual smoking behavior. The decline in the prevalence of ever smoking has been associated with an increase in the percentage of high school seniors who believe that smoking one or more packs of cigarettes each day is a serious health risk (Figure 5). This association has been observed for both genders and for whites and blacks (Bachman, Johnston, O'Malley 1980a, b, 1981, 1984, 1985, 1987, 1991; Johnston, Bachman, O'Malley 1980a, b, 1982, 1984, 1986, 1991; ISR, University of Michigan, unpublished data). For example, during the early 1980s, the percentage of black high school seniors who felt that there is great risk associated with smoking a pack or more per day increased substantially. At the same time, the percentage of black youth who had smoked at all and who had smoked daily declined rapidly. In 1989, over 50 percent of smokers and 74 percent of nonsmokers reported that they believed that smoking a pack or more per day is a serious health risk (1989 MTFP, CDC, OSH, unpublished data).

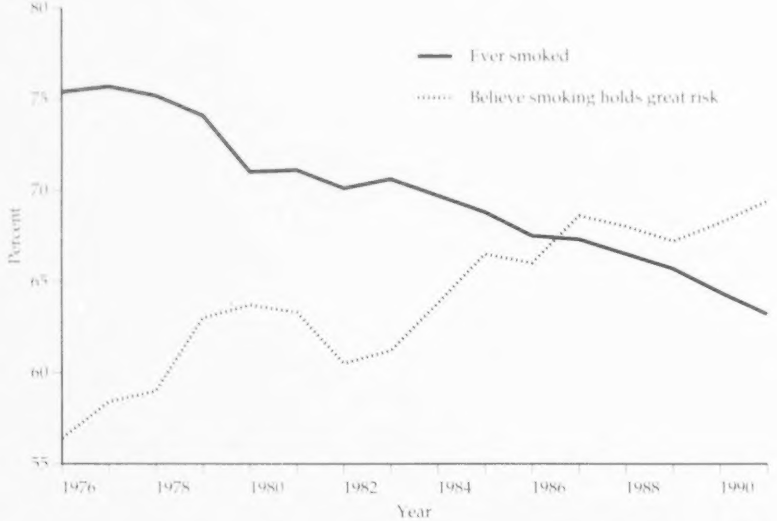
The percentage of seniors who believed that smoking entails a great risk to health increased from 56 percent in 1976 to 69 percent in 1991, and the percentage who believed that the health effects of smoking had been exaggerated decreased from 16 percent in 1981 to 14 percent in 1991 (Table 18). Nonetheless, 3 out of 10 seniors in 1991 still did not believe that heavy smoking poses a serious threat to health.

Among 12- through 18-year-olds in the 1989 TAPS, 32 percent believed that there is no harm in having an occasional cigarette; 57 percent of smokers in the survey endorsed that statement (Allen et al. 1993). Twenty-one percent of smokers and 3 percent of never smokers believed that it is safe to smoke for only a year or two.

Trends in Perceptions About Smoking

The percentage of high school seniors surveyed by the MTFP who considered smoking a "dirty habit" increased between 1981 (66 percent) and 1991 (72 percent) (Table 18). About 73 percent of white and 74 percent of black adolescents now feel this way, compared with only

Figure 5. Trends in the percentage of high school seniors who believe that smoking is a serious health risk and in the percentage who have ever smoked, Monitoring the Future Project, United States, 1976–1991



Sources: Bachman, Johnston, O'Malley (1980a, b, 1981, 1984, 1985, 1987, 1991); Johnston, Bachman, O'Malley (1980a, b, 1982, 1984, 1986, 1991, 1992); Institute for Social Research, University of Michigan (unpublished data).

69 percent of whites and 54 percent of blacks surveyed in 1981 (Johnston, Bachman, O'Malley 1982; ISR, University of Michigan, unpublished data). The perception that smoking is a dirty habit has increased among males, females, smokers, and nonsmokers. Fifty percent of smokers and 81 percent of nonsmokers classified smoking as a dirty habit in 1989 (Johnston, Bachman, O'Malley 1982, 1984, 1986, 1991, 1992; Bachman, Johnston, O'Malley 1984, 1985, 1991; 1981–1989 MTFP, CDC, OSH, unpublished data).

Between 1977 and 1981, the percentage of seniors who felt that their close friends would not, or did not, approve of their smoking increased substantially (Table 18). The percentages reported for 1981 and 1991, however, were essentially identical. The percentage of seniors who believed that adults should be prohibited by law from smoking in certain public places increased from 42 percent in 1977 to 45 percent in 1986 and remained about the same in 1991.

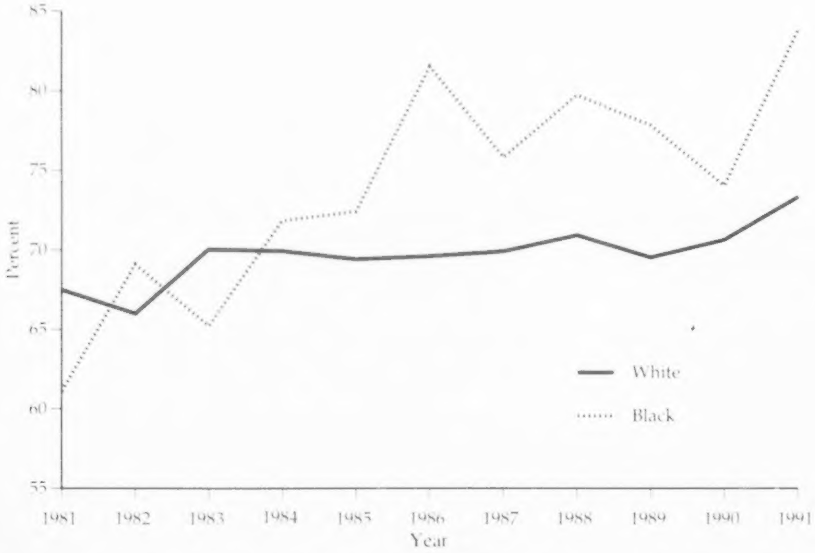
TAPS data on 12- through 18-year-olds provide further information on beliefs about smoking. In 1989, smokers were from two to five times more likely than never smokers to report that they believed that cigarette smoking helps people relax, reduce stress, feel more comfortable in social situations, reduce boredom, and keep their weight down (Allen et al. 1993). Smokers may also deny the addictive properties of cigarettes (USDHHS 1988b). TAPS data indicated that 39 percent of smokers—but only 11 percent of never smokers—believed that they would be able to quit smoking anytime they wanted.

Trends in Perceptions About Smokers

The overwhelming majority of high school seniors surveyed by the MTFP did not believe that cigarette smoking makes smokers their age look mature, in control, or independent (Table 18). About half believed that smoking makes smokers look insecure, and more than 60 percent perceived cigarette smoking as something smokers use to try to look mature. Between 1981 and 1991, smoking among seniors became less of the behavioral norm; fewer than 20 percent of seniors in 1991 reported feeling that smoking is an attempt to conform to such a norm.

Responses to the MTFP indicate that the majority of high school seniors prefer to date nonsmokers and that this is becoming a trend. Since 1981, the proportion of respondents who prefer to date nonsmokers has increased by over 10 percent, to about 74 percent. The most substantial change occurred among black high school seniors (Figure 6). The percentage of white seniors who preferred to date nonsmokers increased only slightly. Over 85 percent of nonsmokers and

Figure 6. Trends in the percentage of high school seniors who prefer to date nonsmokers, by race, Monitoring the Future Project, United States, 1981–1991



Sources: Bachman, Johnston, O'Malley (1981, 1984, 1985, 1987, 1991); Johnston, Bachman, O'Malley (1982, 1984, 1986, 1991, 1992); Institute for Social Research, University of Michigan (unpublished data).

Table 18. Trends in high school seniors' beliefs and attitudes about smoking and smokers, Monitoring the Future Project, United States, 1976, 1981, 1986, 1991

Beliefs and attitudes	1976	1981	1986	1991
About smoking				
How much do you think people risk harming themselves if they smoke one or more packs of cigarettes per day?[*] (percentage who say great risk)	56.4	63.3	66.0	69.4
The harmful effects of cigarettes have been exaggerated.[†] (percentage who agree)		15.5	16.2	13.8
Smoking is a dirty habit. (percentage who agree)		65.5	68.6	71.6
How do you think your close friends feel (or would feel) about your smoking one or more packs of cigarettes per day?[‡] (percentage who disapprove)	60.0[§]	73.9	76.2	74.3
Do you think that people (who are 18 or older) should be prohibited by law from smoking tobacco in certain specified public places? (percentage who say yes)	42.0[§]	43.0	45.1	44.9
About smokers				
In my opinion, when a guy my age is smoking a cigarette, it makes him look (percentage who agree)				
. . . like he's trying to appear mature and sophisticated		61.4	62.7	60.8
. . . insecure		42.0	43.6	47.9
. . . conforming		25.4	21.3	16.5
. . . rugged, tough, independent		8.6	9.9	9.8
. . . mature, sophisticated		5.3	4.6	5.0
. . . cool, calm, in control		6.2	5.5	5.3

Sources: Bachman, Johnston, O'Malley (1980a, 1987); Johnston, Bachman, O'Malley (1980a, 1982); Institute for Social Research, University of Michigan (unpublished data).

[*] Possible responses included "no risk," "slight risk," "moderate risk," "great risk," "can't say—drug unfamiliar." Percentages include those who say "great risk."

[†] Possible responses included "disagree," "mostly disagree," "neither," "mostly agree," "agree." Percentages include those who "agree" or "mostly agree."

[‡] Possible responses included "not disapprove," "disapprove," "strongly disapprove." Percentages include those who "disapprove" or "strongly disapprove."

[§] 1977 data.

Table 18. Continued

Beliefs and attitudes	1976	1981	1986	1991
About smokers				
In my opinion, when a girl my age is smoking a cigarette, it makes her look (percentage who agree)				
. . . like she's trying to appear mature and sophisticated		64.6	65.0	64.1
. . . insecure		47.4	49.5	52.0
. . . conforming		26.5	21.7	19.5
. . . independent and liberated		11.2	9.5	9.6
. . . mature, sophisticated		6.9	5.4	4.5
. . . cool, calm, in control		5.5	4.5	4.1
I prefer to date people who don't smoke. (percentage who agree)		66.5	71.0	74.0
Smokers know how to enjoy life more than nonsmokers. (percentage who agree)		2.8	2.4	3.6
I think that becoming a smoker reflects poor judgment. (percentage who agree)		57.0	59.3	61.0
I strongly dislike being near people who are smoking. (percentage who agree)			45.4	48.9
I personally don't mind being around people who are smoking. (percentage who agree)		38.2	36.9	33.1
Do you disapprove of people (≥ age 18) who smoke one or more packs of cigarettes per day? (percentage who disapprove)	65.9	70.0	75.4	71.4

about one-third of smokers preferred to date nonsmokers in 1989 (1989 MTFP, CDC, OSH, unpublished data).

Findings from the 1989 TAPS also suggest that few adolescents consider smoking a norm for their age group. Two-thirds of 12- through 18-year-old respondents agreed with the statement, "Seeing someone smoking turns me off," and 86 percent (94 percent of never smokers and 51 percent of current smokers) preferred to date nonsmokers (Allen et al. 1993).

Adolescents seem to be more concerned about people smoking around them. In the MTFP, the percentage of high school seniors who strongly disliked being near smokers increased between 1986 (45 percent) and 1991 (49 percent), and the percentage who reported that they did not mind being around smokers declined (from 38 percent in 1981 to 33 percent in 1991) (Table 18). Males were consistently more likely than females to mind being around smokers (Johnston, Bachman, O'Malley 1982, 1984, 1986, 1991, 1992; Bachman, Johnston, O'Malley 1984, 1985, 1991; ISR, University of Michigan, unpublished data). The percentage of female seniors who did not mind being around smokers changed little over time. From 1981 through 1991, the proportion of high school seniors who did not mind being around people who were smoking decreased by about 50 percent among blacks and by only 5 percent among whites (Figure 7). Smokers' acceptance of being around other smokers remained constant, at approximately 70 percent, from 1981 through 1989, whereas the percentage of nonsmokers who did not mind being around smokers decreased from 25 to 21 percent (1981–1989 MTFP surveys, CDC, OSH, unpublished data).

Adult Implications of Adolescent Smoking

Some notable findings regarding young people's expectations to smoke, or to abstain from smoking, have emerged from the MTFP (see Johnston, O'Malley, Bachman 1992b). In their senior year, respondents who answered one of five questionnaire forms were asked, "Do you think you will be smoking cigarettes five years from now?" Overall, about 1 percent said they "definitely" would be smoking in five years, 14 percent said they "probably" would, 27 percent said they probably would not, and 58 percent said they definitely would not (Table 19). About 55 percent of past-month smokers and about 45 percent of daily smokers stated that they probably would not or definitely would not be smoking in five years.

Of the seniors in the full panel, 68 percent indicated that they had not smoked in the 30 days preceding the senior-year survey; 9 percent had smoked less than one cigarette per day; 8 percent had smoked one to five cigarettes per day; 7 percent had smoked about one-half pack per day; and 8 percent had smoked a pack or more per day (Table 20). Five years after graduation, the same total proportion (32 percent) were past-month smokers. Somewhat more (26 vs. 23 percent), however, were daily smokers. Further, for each smoking group defined by senior-year smoking level, those who continued to smoke increased their frequency of smoking (Tables 20–21).

Of the respondents who were nonsmokers at the end of their senior year, 86 percent remained nonsmokers five to six years later, whereas only 13 percent of those who smoked one pack each day in their senior year became nonsmokers (Table 20). Those students who smoked one-half pack per day in their senior year were nearly as likely to continue use as were those students who smoked one pack daily; 81 percent of half-pack-a-day smokers still smoked, and the majority of them increased their rate of smoking (Table 21). Seventy percent of respondents who in their senior year smoked one to five cigarettes per day continued to smoke five years later; most of these continuing smokers increased their rate of use. Even among the seniors who smoked the least (less than one cigarette per day), 42 percent continued to smoke five to six years later, and two-thirds of these had increased their rate of smoking.

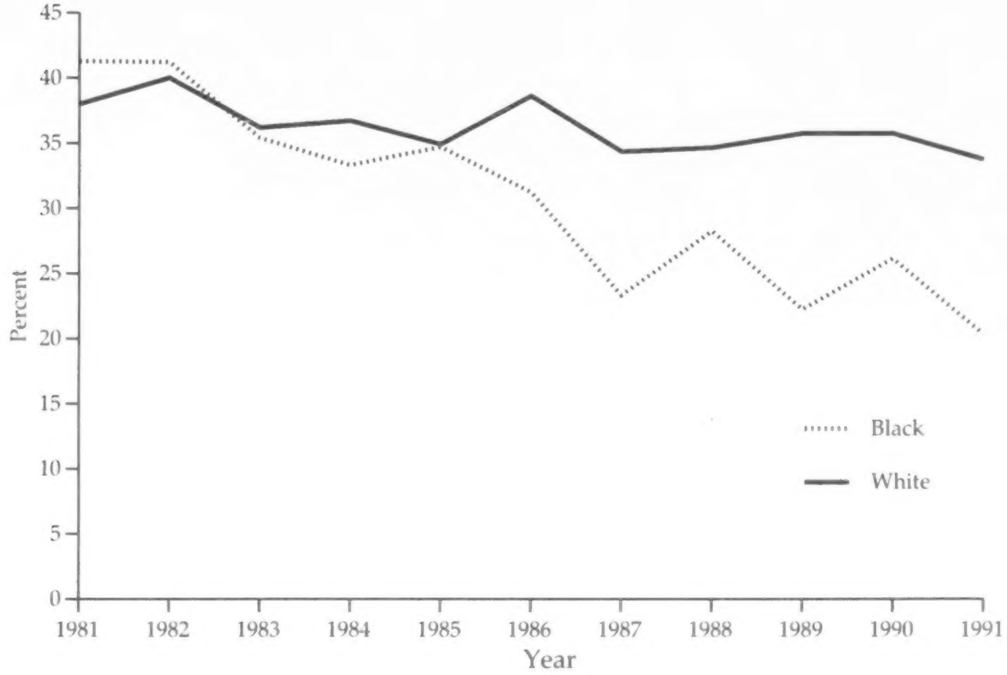
When earlier smoking behavior is controlled, seniors' expectations to smoke had very limited power to predict subsequent smoking behavior (Table 22). Many seniors who smoked one pack per day had expectations of discontinuing use. These expectations showed no relationship to the actual rate of smoking five to six years later. The same is true for those seniors who smoked

Table 19. High school seniors predicting whether they will be smoking in five years, by smoking status in senior year, Monitoring the Future Project, United States, 1976–1986 senior classes

Senior year smoking status (use in past 30 days)	Predicted likelihood of smoking in five years (%)*				
	Definitely will	Probably will	Probably will not	Definitely will not	Number (weighted)
None	0.4	1.3	21.0	77.3	1,926
< 1 cigarette/day	0.5	14.7	56.5	28.3	248
1–5 cigarettes/day	1.8	37.6	44.1	16.5	211
About ½ pack/day	0.6	57.7	30.3	11.3	197
≥ 1 pack/day	5.1	62.9	26.7	5.2	228
Total	0.9	14.2	27.0	58.0	2,810

Source: Institute for Social Research, University of Michigan (unpublished data).
*Entries are row percentages.

Figure 7. Trends in the percentage of high school seniors who do not mind being around people who are smoking, by race, Monitoring the Future Project, United States, 1981–1991



Sources: Bachman, Johnston, O'Malley (1981, 1984, 1985, 1987, 1991); Johnston, Bachman, O'Malley (1982, 1984, 1986, 1988, 1991,1992); Institute for Social Research, University of Michigan (unpublished data).

Table 20. Intensity of smoking (%) in senior year of high school, by intensity of smoking 5–6 years later, Monitoring the Future Project, United States, 1976–1986

	Smoking intensity (past 30 days) 5–6 years later (%)*						
Senior-year smoking intensity (use in past 30 days)	**None**	**< 1 cigarette /day**	**1–5 cigarettes /day**	**½ pack**	**≥ 1 pack**	**Number (weighted)**	**Column percentage**
None	85.6	4.9	2.6	2.7	4.1	9,238	67.6
< 1 cigarette/day	57.8	14.4	9.6	7.8	10.4	1,268	9.3
1–5 cigaretes per day	29.6	8.8	17.2	20.5	23.9	1,058	7.7
About ½ pack/day	18.8	4.9	8.7	21.7	46.0	1,000	7.3
≥ 1 pack/day	13.4	2.7	4.1	10.1	69.7	1,100	8.1
Total	68.0	5.9	5.0	6.6	14.6	13,665	100.0

Source: Institute for Social Research, University of Michigan (unpublished data).
*Entries are row percentages.

Table 21. Direction of change in smoking behavior (%) between senior year of high school and 5–6 years later, Monitoring the Future Project, United States, 1976–1986 senior classes

Senior-year smoking status (use in past 30 days)	Smoking status 5–6 years later*				
	Quit	Less use	Same level	More use	Number (weighted)
None			85.6	14.4	9,238
< 1 cigarette/day	57.8		14.4	27.8	1,268
1–5 cigarettes/day	29.6	8.8	17.2	44.4	1,058
About ½ pack/day	18.8	13.6	21.7	46.0	1,000
≥ 1 pack/day	13.2	17.7	40.2	29.0	869

Source: Institute for Social Research, University of Michigan (unpublished data).
*Entries are row percentages.

Table 22. Smoking intensity 5–6 years after high school, by senior-year smoking status and expectation to smoke in 5 years, Monitoring the Future Project, United States, 1976–1986 senior classes

Senior-year smoking intensity (use in past 30 days) and predicted likelihood of smoking in 5 years	Smoking intensity (past 30 days) 5–6 years later*					
	None	< 1 cigarette /day	1–5 cigarettes /day	1/2 pack/day	≥ 1 pack /day	Number (weighted)
None						
Will smoke	55.3	10.6	19.8	8.3	5.9	30
Will not smoke	84.7	5.6	2.9	2.5	4.3	1,829
Total	84.2	5.7	3.2	2.6	4.3	1,859
< 1 cigarette/day						
Will smoke	41.7	18.4	19.5	14.0	6.4	36
Will not smoke	58.4	14.7	9.7	9.7	7.5	208
Total	55.9	15.2	11.1	10.4	7.3	244
1–5 cigarettes/day						
Will smoke	32.3	3.0	15.5	23.0	26.2	83
Will not smoke	31.8	5.8	15.9	23.0	23.5	125
Total	32.0	4.7	15.7	23.0	24.6	208
About 1/2 pack/day						
Will smoke	15.5	4.9	6.5	21.0	52.1	115
Will not smoke	17.6	2.5	6.5	21.1	52.3	81
Total	16.4	3.9	6.5	21.1	52.2	196
≥ 1 pack/day						
Will smoke	13.3	2.2	3.2	9.6	71.8	153
Will not smoke	13.2	1.6	5.3	6.3	73.6	72
Total	13.3	2.0	3.8	8.5	72.4	225
Grand Total	67.0	6.0	5.2	6.6	15.2	2,731

Source: Institute for Social Research, University of Michigan (unpublished data).
*Entries are row percentages.

one-half pack—or even as little as one to five cigarettes—per day in high school. Expectations were predictive only for those smokers who smoked less than one cigarette per day; 58 percent of those who thought they probably or definitely would be smoking in the future did, in fact, continue to smoke, whereas only 42 percent of those who did not expect to smoke in the future did smoke. Among seniors who had never smoked, less than 2 percent thought they would be smoking in five years (Table 19). This small group did, in fact, have a higher rate of subsequent smoking (45 percent) than never smokers who did not expect to be smoking in five years (15 percent) (Table 22).

Thus, the expectation to avoid smoking seemed to make some difference among nonsmokers and very light smokers in high school, although very few seniors in these groups reported an expectation to smoke. On the other hand, among light, moderate, and heavy daily smokers, the expectation to abstain from smoking in the future seemed overwhelmed by the strong forces that tend to maintain or advance smoking behavior once it is established. One implication of these results is that young people should be made aware of the strongly addictive nature of nicotine and its ability to overwhelm future good expectations. Clearly, prevention is the major goal, but immediate cessation is of critical importance for adolescents, even for those who smoke very little in high school.

Smoking and Other Drug Use

In Chapter 2, tobacco use is discussed as a possible predictor of other drug use (see "Smoking as a Risk Factor for Other Drug Use" and "Smokeless Tobacco Use as a Risk Factor for Other Drug Use"). The present chapter presents detailed information on high school seniors' usage patterns for cigarettes, alcohol, marijuana, cocaine, inhalants, and smokeless tobacco. Both prevalence of past-month use and comparisons of the self-reported age at first use of each will be presented.

Prevalence of Smoking and Other Drug Use

Among high school seniors in the MTFP studies, the majority of alcohol users (60 percent) and smokeless tobacco users (57 percent) did not smoke (Table 23). The majority of marijuana (62 percent), cocaine (68 percent), and inhalant (56 percent) users smoked cigarettes. Cigarette smoking prevalence was from 1.9 to 3.9 times higher among users of these drugs than among nonusers.

Although most drinkers (60 percent) did not smoke, almost all smokers (88 percent) were drinkers. Almost one-half (45 percent) of cigarette smokers were also marijuana smokers, 11 percent were cocaine users, 5 percent used inhalants, and 33 percent used smokeless tobacco (which will be discussed separately later in this chapter). The prevalence of

Table 23. Prevalence (%) of cigarette smoking among users of other drugs and prevalence of other drug use among smokers,[*] high school seniors, Monitoring the Future Project, United States, 1985–1989

Other substances	Prevalence of smoking among users of other drugs	Prevalence of smoking among nonusers of other drugs	Prevalence of drug use among smokers	Prevalence of drug use among nonsmokers
Alcohol	40.0	10.3	87.6	54.8
Marijuana	62.1	20.3	44.9	11.2
Cocaine[†]	68.1	27.2	10.9	2.1
Inhalants[‡]	56.1	28.5	4.8	1.5
Smokeless tobacco[§]	43.0	22.4	32.5	15.6

Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

[*] Any use of cigarettes or other drugs during the past month.

[†] Includes "coke," "crack," and "rock."

[‡] Glue, aerosols, laughing gas, etc.

[§] Males only, 1986–1989 senior classes only.

other drug use was from 1.6 to 5.2 times more prevalent among cigarette smokers than nonsmokers.

Grade When Smoking and Other Drug Use Begins

MTFP data from 1986 through 1989 were merged to observe the grade at which seniors reported trying cigarettes, smokeless tobacco, alcohol, marijuana, and cocaine (Figure 8). Among ever smokers, 31 percent tried their first cigarette by the sixth grade, and 61 percent first smoked by the eighth grade. Among those who had used smokeless tobacco, 23 percent had first done so by the sixth grade, and 53 percent by the eighth grade. Proportionately fewer users of alcohol, marijuana, and cocaine initiated use as early as respondents initiated use of cigarettes and smokeless tobacco. Thirty-four percent of alcohol users, 26 percent of marijuana users, and 6 percent of cocaine users first tried these drugs by the eighth grade.

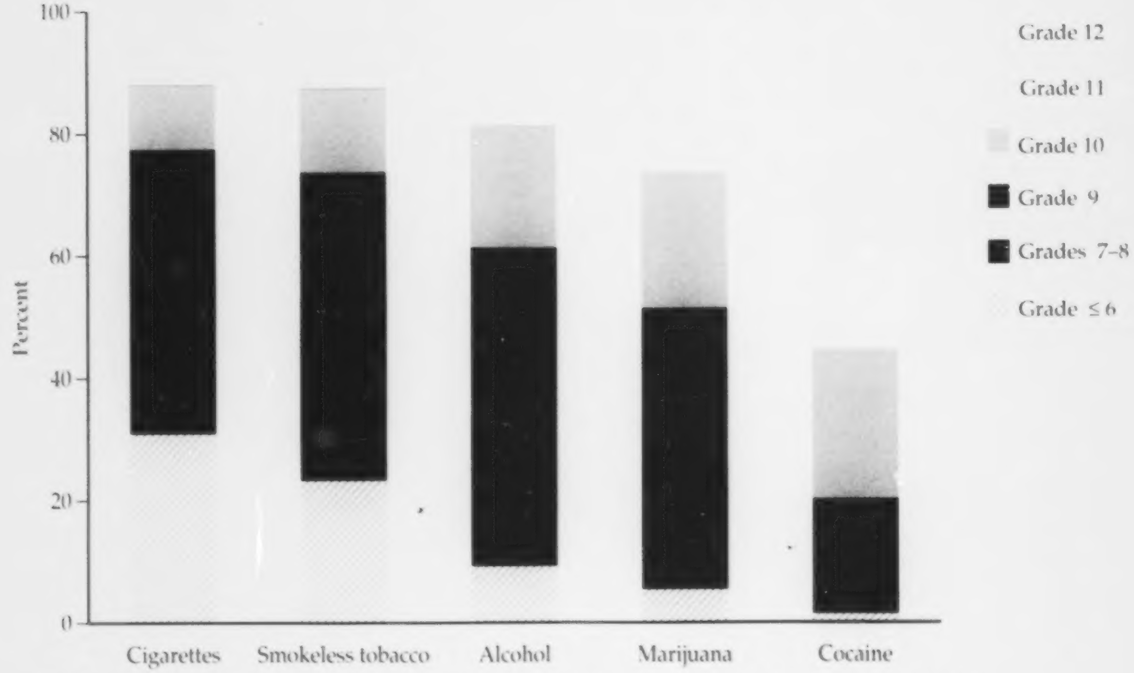
By the 12th grade, only 8 percent of MTFP respondents had not tried cigarettes or alcohol; 68 percent had tried both, and 24 percent had tried alcohol but not cigarettes (Table 24). Of those students who had tried both cigarettes and alcohol by 12th grade, almost half (49 percent) had tried cigarettes before trying alcohol; 33 percent had tried both at about the same time.

About 30 percent of all students had not tried cigarettes or marijuana by the 12th grade (Table 25); 44 percent had tried both, and 22 percent had tried cigarettes but not marijuana. Of those who had tried both by 12th grade, most students (65 percent) had tried cigarettes before marijuana; 23 percent had tried both at about the same time.

About one-third of seniors (34 percent) had not tried cigarettes or cocaine; 12 percent had tried both, and over half (53 percent) had tried cigarettes but not cocaine (Table 26). Of those who had tried both by 12th grade, 90 percent had tried cigarettes before trying cocaine, and 9 percent had tried both at about the same time.

These data support the contention that tobacco use falls early in the sequence of drug use for young adolescents and therefore may be considered a "gateway" drug.

Figure 8. **Grade when respondents (high school seniors) first tried cigarettes, smokeless tobacco, alcohol, marijuana, and cocaine, among respondents who had ever used these substances by grade 12, Monitoring the Future Project, United States, 1986–1989**



Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

Table 24. Percent distribution of high school seniors (N [weighted] = 19,831), by grade in which they first (if ever) used cigarettes and alcohol, Monitoring the Future Project, United States, 1986–1989

Grade when respondent first tried cigarettes	Grade when respondent first tried alcohol							
	≤ 6	7–8	9	10	11	12	Never used	Row total
≤ 6	4.2	7.2	4.9	2.5	1.5	0.6	0.3	21.2
7–8	1.3	8.0	6.4	3.1	1.3	0.5	0.2	20.8
9	0.4	2.0	4.9	2.4	1.0	0.4	0.1	11.1
10	0.3	1.1	1.9	2.8	1.0	0.3	*	7.4
11	0.2	0.5	1.2	1.6	1.6	0.3	0.1	5.5
12	0.1	0.3	0.5	0.6	0.6	0.6	0.1	2.7
Never used	2.0	3.8	5.3	5.3	4.7	2.8	7.5	31.4

Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

* < 0.05.

Note: Totals may not equal the sum of individual percentages because of rounding.

Table 25. Percent distribution of high school seniors (N [weighted] = 20,657), by grade in which they first (if ever) tried cigarettes and marijuana, Monitoring the Future Project, United States, 1986–1989

Grade when respondent first tried cigarettes	Grade when respondent first tried marijuana							
	≤ 6	7–8	9	10	11	12	Never used	Row total
≤ 6	2.0	4.5	3.3	2.2	1.4	0.8	6.2	20.3
7–8	0.3	4.1	4.4	2.9	1.5	0.8	5.8	19.8
9	0.1	0.5	2.5	2.3	1.2	0.6	3.5	10.7
10	0.1	0.2	0.5	1.7	1.4	0.5	2.6	6.9
11	*	0.1	0.3	0.4	1.3	0.6	2.5	5.2
12	*	*	0.1	0.2	0.2	0.5	1.5	2.6
Never used	0.2	0.5	0.9	0.9	0.9	0.6	30.5	34.5

Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

*< 0.05.

Note: Totals may not equal the sum of individual percentages because of rounding.

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Table 26. Percent distribution of high school seniors (N [weighted] = 21,007), by grade in which they first (if ever) used cigarettes and cocaine, Monitoring the Future Project, United States, 1986–1989

Grade when respondent first tried cigarettes	Grade when respondent first tried cocaine							
	≤ 6	7–8	9	10	11	12	Never used	Row total
≤ 6	0.1	0.4	0.9	1.2	1.4	0.9	15.4	20.3
7–8	*	0.2	0.6	1.1	1.3	0.9	15.6	19.7
9	*	*	0.2	0.5	0.6	0.3	9.0	10.7
10	*	*	*	0.2	0.4	0.2	6.1	7.0
11	*	*	*	*	0.2	0.2	4.8	5.2
12	*	*	*	*	*	0.1	2.5	2.6
Never used	*	*	0.1	0.2	0.2	0.3	33.8	34.5

Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

* < 0.05.

Note: Totals may not equal the sum of individual percentages because of rounding.

Table 27. Percentage of high school students who used tobacco, by behaviors that contribute to unintentional and intentional injuries, Youth Risk Behavior Survey, United States, 1991

Risk behavior	Number	Any cigarette use[*]	Current cigarette use[†]	Current frequent cigarette use[‡]	Current smokeless tobacco use[§]
Seat belt use[∥]					
Always	2,908	60.2	17.8	6.8	13.5
Most the time/sometimes	5,651	70.1	26.3	11.4	17.6
Rarely/never	3,548	80.6	40.3	21.8	26.5
Physical fighting[¶]					
0 times	6,864	63.9	20.3	8.1	13.9
1–5 times	4,358	77.8	35.4	17.3	23.2
≥ 6 times	789	82.6	49.3	30.5	32.1
Weapon carrying[**]					
0 days	8,703	65.5	22.6	9.4	13.3
≥ 1 day	3,171	82.8	41.1	22.2	27.5
Attempted suicide[¶]					
0 times	10,060	68.2	24.8	10.6	17.8
≥ 1 time	824	85.0	52.5	33.8	33.6

Sources: Centers for Disease Control and Prevention (CDC), Division of Adolescent and School Health (unpublished data); CDC, Office on Smoking and Health (unpublished data).

[*] During the respondent's lifetime.

[†] Cigarette use on ≥ 1 day during the 30 days preceding the survey.

[‡] Cigarette use on ≥ 20 days during the 30 days preceding the survey.

[§] During the 30 days preceding the survey; includes chewing tobacco or snuff; males only.

[∥] When riding in a car driven by someone else.

[¶] During the 12 months preceding the survey.

[**] During the 30 days preceding the survey; includes any weapon such as a gun, knife, or club.

Cigarette use is most likely to precede use of other substances and to be prevalent among users of other drugs.

Cigarette Smoking and Other Health-Related Behaviors

Available data on the relationships between cigarette smoking and other health-related behaviors are derived from cross-sectional studies and thus suggest that other behaviors may covary with adolescent smoking. Even if the direction of influence is not established, information on the extent of these relationships is useful for intervention, since such data may suggest a syndrome of health-compromising behaviors that need to be considered together.

Data from the 1991 YRBS indicate that high school students who reported practicing other selected health-risk behaviors were more likely to be past-month or frequent smokers than were those who reported fewer selected health-risk behaviors. For example, students in the survey were more likely to be past-month or frequent smokers if they rarely or never wore seat belts, had participated in a physical fight six or more times during the preceding year, had carried weapons one or more days during the preceding month, or had made one or more suicide attempts during the preceding year (Table 27). Students were also more likely to be past-month or frequent smokers if they had ever had sexual intercourse, had had sexual intercourse with four or more partners during their lifetime, or had not used a condom during their most recent sexual intercourse (Table 28). These relationships for sexual risk behaviors held for males and females, regardless of age (CDC, OSH, unpublished data). Lastly, students were more likely to be past-month or frequent smokers if they had not participated on any sponsored sports teams during the preceding year or if they had used steroids without a doctor's prescription (Table 29).

Cigarette Smoking and Health Status

Pregnancy and Smoking

Data on maternal smoking status during pregnancy are recorded on birth certificates in 43 states and the District of Columbia (NCHS 1992b). In these states, the overall maternal smoking prevalence was 20 percent in 1989. Maternal smoking among adolescent women

Table 28. Percentage of high school students who used tobacco, by sexual risk behaviors, Youth Risk Behavior Survey, United States, 1991

Risk behavior	Number	Any cigarette use[*]	Current cigarette use[†]	Current frequent cigarette use[‡]	Current smokeless tobacco use[§]
Sexual intercourse[∥]					
No	5,011	55.1	13.8	3.1	12.9
Yes	6,508	82.6	38.8	20.7	23.9
Number of sexual partners[∥]					
1–3	4,048	81.0	33.8	15.4	23.2
≥ 4	2,443	85.4	47.9	30.3	24.9
Condom use[¶]					
No	2,494	86.4	46.2	27.5	23.8
Yes	2,091	79.3	36.0	18.5	26.6

Sources: Centers for Disease Control and Prevention (CDC), Division of Adolescent and School Health (unpublished data); CDC, Office on Smoking and Health (unpublished data).

[*] During the respondent's lifetime.

[†] Cigarette use on ≥ 1 day during the 30 days preceding the survey.

[‡] Cigarette use on ≥ 20 days during the 30 days preceding the survey.

[§] Any smokeless tobacco use, including chewing tobacco or snuff, during the 30 days preceding the survey; males only.

[∥] During the respondent's lifetime.

[¶] During last sexual intercourse, among students who had sexual intercourse during the 3 months preceding the survey.

Table 29. Percentage of high school students who used tobacco, by participation on sports teams and steroid use, Youth Risk Behavior Survey, United States, 1991

Category	Number	Any cigarette use[*]	Current cigarette use[†]	Current frequent cigarette use[‡]	Current smokeless tobacco use[§]
Participation on sports teams[‖]					
Total					
0 teams	5,738	73.6	31.3	17.2	6.6
≥ 1 team	6,429	67.2	24.3	8.9	13.5
Female					
0 teams	3,608	72.0	29.0	14.3	0.7
≥ 1 team	2,635	66.3	24.8	9.6	2.1
Male					
0 teams	2,125	76.1	34.8	21.6	15.5
≥ 1 team	3,794	67.8	23.9	8.4	21.0
Steroid use[¶]					
Total					
0 times	11,868	69.7	26.8	12.1	9.7
≥ 1 time	382	87.2	54.8	35.7	38.7
Female					
0 times	6,164	69.3	26.9	12.2	1.1
≥ 1 time	116	88.5	61.8	29.9	16.5
Male					
0 times	5,700	70.0	26.6	12.0	18.1
≥ 1 time	265	86.8	52.6	27.0	44.6

Source: Centers for Disease Control and Prevention, Division of Adolescent and School Health (unpublished data).

[*] During the respondent's lifetime.

[†] Cigarette use on ≥ 1 day during the 30 days preceding the survey.

[‡] Cigarette use on ≥ 20 days during the 30 days preceding the survey.

[§] During the 30 days preceding the survey; includes chewing tobacco or snuff.

[‖] During the 12 months preceding the survey; includes sports teams sponsored by school and other organizations.

[¶] During the respondent's lifetime, without a doctor's prescription.

(under 20 years old) was highest among women aged 18 and 19 (24 percent) and lowest among women younger than 15 years of age (8 percent) (Table 30). White non-Hispanic adolescent mothers were more likely to have smoked during pregnancy than white non-Hispanic mothers 20 through 49 years old. Black non-Hispanic adolescent mothers were less likely to have smoked than those 20 through 49 years old; Hispanic adolescent mothers were about as likely as older Hispanic mothers to have smoked. Among the mothers who smoked during pregnancy, about 23 percent of those younger than 15 years of age smoked more than 10 cigarettes per day; 34 percent of mothers 15 through 19 years old, and 44 percent of mothers 20 through 49 years old smoked more than 10 cigarettes per day during the pregnancy (NCHS 1992b).

Self-Reported Indicators of Health Status Among Smokers

The MTFP collected data on self-reported indicators of health status among the nation's high school seniors. A five-category scale of lifetime smoking history was constructed from questions on lifetime smoking and on the grade in which the respondent began smoking daily (Table 31). Nine measures of health status were analyzed in terms of lifetime smoking history. Adjusted odds ratios were calculated by regressing the logit-transformed prevalence of each health measure over the prior year on the variable for lifetime smoking history and on the covariates of current marijuana use, lifetime cocaine use, parental education, and time (Hosmer and Lemeshow 1989). Alcohol use was also included as a covariate for the measures of staying at home because of not feeling well and of overall physical health. Current smokers were more likely than never smokers to report all of the symptoms or indicators listed. A trend test (using the linear contrast of the estimated regression coefficients for smoking history [Miller 1986]) revealed that these adolescent smokers were more likely than never smokers to experience all but two of the health status measures (e.g., sinus congestion and sore throat).

Self-Reported Indicators of Nicotine Addiction Among Smokers

The research of McNeill (McNeill et al. 1986; McNeill, Jarvis, West 1987; McNeill 1991) has demonstrated the presence of nicotine addiction in young smokers (11 through 16 years old) in Great Britain. A majority of these young smokers experienced withdrawal symptoms during abstinence or had some difficulty quitting (McNeill et al. 1986; McNeill, Jarvis, West 1987). The 1991 NHSDA asked 12- through 18-year-olds questions that probed various components of nicotine addiction (USDHHS 1988b). Current smokers who had smoked at least 100 cigarettes in their lifetime were the most likely of adolescent smokers to report having experienced several indicators of nicotine addiction (Table 32). Four of every five of these heavier smokers who tried to cut down on cigarettes during the previous 12 months had failed. Seventy percent felt that they needed or were dependent on cigarettes.

Persons who had smoked at least 100 cigarettes in their lifetime but none in the last month were the next most likely to report that they felt dependent on cigarettes and that they had experienced withdrawal during the previous 12 months. These persons were more likely to have become regular smokers than were those who had not yet smoked 100 cigarettes. Though these respondents were more likely to show signs of addiction, they were evidently able to discontinue smoking for at least one month—a finding consistent with the observation that less-addicted smokers are more able to quit (USDHHS 1988b). Respondents who had not smoked 100 cigarettes by the time they were surveyed appeared less likely to become addicted to nicotine than those who had smoked at least 100 cigarettes.

Table 30. Cigarette smoking prevalence (%) during pregnancy among mothers of live-born infants, by age and race/Hispanic origin, 43 states and the District of Columbia, 1989

	Age (years)			
Race/Hispanic origin	**< 15**	**15–17**	**18–19**	**20–49**
Overall	7.7	19.0	23.9	19.1
White, non-Hispanic	21.2	32.1	33.3	20.5
Black, non-Hispanic	2.7	6.2	10.4	20.2
Hispanic	5.9	7.5	8.7	8.0

Source: National Center for Health Statistics (1992b).

Table 31. Adjusted odds ratios* (and 95% confidence intervals) for symptoms of diseases and smoking status among high school seniors who have smoked occasionally or regularly, Monitoring the Future Project, United States, 1982–1989

Self-reported symptom/ indicator[†]	Have smoked occasionally, but not regularly	Smoked regularly at one time, but not in the past 30 days	Smoke regularly now, began daily smoking in grades 10–12	Smoke regularly now, began daily smoking by grade 9
Shortness of breath when not exercising	1.38 (1.24, 1.52)	1.90 (1.56, 2.31)	2.32 (2.03, 2.64)	2.72 (2.40, 3.08)
Chest cold	1.34 (1.23, 1.46)	1.34 (1.13, 1.60)	1.53 (1.35, 1.73)	1.72 (1.52, 1.93)
Sinus congestion, runny nose, sneezing	1.31 (1.20, 1.44)	0.99 (0.83, 1.19)	1.17 (1.02, 1.34)	1.19 (1.05, 1.35)
Coughing spells	1.33 (1.24, 1.43)	1.28 (1.11, 1.48)	2.04 (1.83, 2.27)	2.20 (1.98, 2.45)
Cough with phlegm or blood	1.42 (1.28, 1.56)	1.73 (1.44, 2.09)	2.31 (2.02, 2.63)	2.32 (2.04. 2.64)
Wheezing or gasping	1.41 (1.26, 1.48)	2.45 (1.99, 3.01)	2.36 (2.06, 2.70)	2.57 (2.25, 2.95)
Sore throat or hoarse voice	1.36 (1.26, 1.48)	1.07 (0.92, 1.26)	1.34 (1.19, 1.52)	1.17 (1.04, 1.32)
Stayed home most or all of day because not feeling well[‡]	1.43 (1.31, 1.55)	1.38 (1.17, 1.62)	1.53 (1.35, 1.73)	1.56 (1.39, 1.76)
Overall physical health[‡§]	1.47 (1.32, 1.63)	2.39 (1.98, 2.90)	1.98 (1.72, 2.28)	2.08 (1.81, 2.38)

Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

*Adjusted for past-month marijuana use, lifetime cocaine use, parental education, and time. Odds ratios are relative to those for seniors who had either never smoked cigarettes or had smoked cigarettes once or twice only.

[†] Occurrence during the previous 30 days, with the exeption of overall physical health.

[‡] Also adjusted for past-month alcohol use.

[§] Odds ratios based on the percentage who reported that their health was poorer than average during the preceding year.

Table 32. Self-reported indicators of nicotine addiction among 12–18-year-olds (N = 1,589), by smoking history, National Household Surveys on Drug Abuse, United States, 1991

	Smoking history[*]			
Indicator[†]	Have smoked 1–99 cigarettes, but none in past month (%)	Have smoked ≥ 100 cigarettes, but none in past month (%)	Have smoked 1–99 cigarettes and smoked in past month (%)	Have smoked ≥ 100 cigarettes and smoked in past month (%)
Tried to cut down on use of cigarettes	43.7	72.2	44.9	73.4
Unable to cut down on use of cigarettes[‡]	46.9	40.4	59.5	81.2
Felt need to have more cigarettes to get the same effect	10.9	14.2	12.2	27.1
Felt need to have cigarettes or felt dependent on cigarettes	12.2	37.2	16.2	70.1
Felt sick because of stopping or cutting down on cigarettes[‡]	15.9	24.9	14.1	37.4

Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

[*] Among people who smoked cigarettes at all in the past 12 months.

[†] Occurrence during the past 12 months.

[‡] Analysis limited to people who tried to cut down on cigarettes during the last 12 months.

Smokeless Tobacco Use Among Young People in the United States

Recent Patterns of Smokeless Tobacco Use

Ever Use of Smokeless Tobacco

The overall national estimates for adolescents who had tried smokeless tobacco were 18 percent for 12- through 18-year-olds in the 1989 TAPS, 13 percent for the same age group in the 1991 NHSDA, and 32 percent for high school seniors surveyed by the MTFP in 1992 (Table 33). In all three surveys, males were much more likely than females to have tried smokeless tobacco. White males were more likely than any other subgroup to have tried this product.

The prevalence of adolescents who had used smokeless tobacco increased with increasing age. Twenty-eight percent of 17- and 18-year-old TAPS respondents, 21 percent of 17- and 18-year-old NHSDA respondents, and 32 percent of high school seniors in the 1992 MTFP survey reported that they had tried smokeless tobacco. Adolescents in the northeast region of the United States were less likely than those in the other regions to have tried smokeless tobacco.

Current Use of Smokeless Tobacco

Available data suggest that there was an increase in the use of smokeless tobacco among adolescents between 1970 and the mid-1980s. The prevalence of chewing tobacco use was 1.2 percent among 17- through 19-year-old males in the 1970 NHIS (USDHHS 1986, 1989b), 3.0 percent among 16- through 19-year-old males in the 1985 Current Population Survey (Marcus et al. 1989; USDHHS 1986), and 5.3 percent among 17- through 19-year-old males in the 1986 Adult Use of Tobacco

Table 33. **Percentage of young people who have ever used smokeless tobacco, by gender, race/Hispanic origin, age/grade, and region, Teenage Attitudes and Practices Survey (TAPS), National Household Surveys on Drug Abuse (NHSDA), Monitoring the Future Project (MTFP), United States, 1989, 1991, 1992**

Characteristic	TAPS[*]	NHSDA[†]	MTFP[‡§]
Overall	18.4	13.2	32.4
Gender			
Male	31.3	22.3	53.7
Female	4.4	3.5	12.1
Race/Hispanic origin			
White, non-Hispanic	22.4	16.6	38.2
Male	38.6	28.4	61.6
Female	4.8	4.4	15.2
Black, non-Hispanic	7.6	4.5	10.7
Male	11.9	6.7	18.0
Female	3.1	2.1	4.9
Hispanic	8.1	4.8	NA[‖]
Male	13.4	8.8	NA
Female	2.3	0.5	NA
Age/grade			
12–14 years	9.6	6.5	
15–16 years	20.8	15.0	
17–18 years	28.2	20.9	
8th grade			20.7
10th grade			26.6
12th grade			32.4
Region			
Northeast	14.0	9.0	25.3
North Central	19.7	14.0	38.6
South	21.4	13.9	31.5
West	15.8	14.5	32.0

Sources: **1989 TAPS**: Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (OSH) (unpublished data); **1991 NHSDA**: CDC, OSH (unpublished data); **1992 MTFP**: Johnston, O'Malley, Bachman (in press); Institute for Social Research, University of Michigan (unpublished data).

[*] 1989 TAPS, aged 12–18 years. Based on response to the question, "Have you ever tried using chewing tobacco or snuff?"

[†] 1991 NHSDA, aged 12–18 years. Based on response to the question, "When was the most recent time you used chewing tobacco or snuff or other smokeless tobacco? ("Never used smokeless tobacco in lifetime" was a precoded response.)

[‡] 1992 MTFP survey of high school seniors. Based on response to the question, "Have you ever taken or used smokeless tobacco (snuff, plug, dipping tobacco, chewing tobacco)?" Respondents who reported that they had taken or used smokeless tobacco at least once or twice were classified as ever users.

[§] With the exception of data for 8th- and 10th-grade students, all other data points for the MTFP surveys reflect estimates for high school seniors.

[‖] NA = Not available.

Survey (AUTS) (USDHHS 1989b). The same surveys indicated that the prevalence of snuff use was 0.3 percent among 17- through 19-year-old males in 1970, 2.9 percent among 16- through 19-year-old males in 1985, and 5.3 percent among 17- through 19-year-old males in 1986.

In the 1986–1989 MTFP surveys, high school seniors' past-month use of smokeless tobacco declined slightly for all respondents (from 12 to 8 percent), for whites (from 13 to 10 percent), and for males (from 22 to 16 percent) (Bachman, Johnston, O'Malley 1987, 1991; Johnston, Bachman, O'Malley 1991, 1992). In the 1992 MTFP survey, however, past-month use of smokeless tobacco was 11 percent for all respondents, 14 percent for whites, and 21 percent for males (ISR, University of Michigan, unpublished data). In the NHSDA, the prevalence of past-month use of smokeless tobacco among 12- through 17-year-old males was 6.6 percent in 1988 and 5.3 percent in 1991 (USDHHS 1989a, 1992a). In the same survey, use of smokeless tobacco in the past year was estimated to be 11.1 percent in 1985, 7.0 percent in 1988, 6.1 percent in 1990, and 6.1 percent in 1991. A parallel decline has been reported among young adults (18 through 25 years old): the prevalence of past-year use of smokeless tobacco in this group was 11.1 percent in 1985, 8.9 percent in 1988, 9.2 percent in 1990, and 8.7 percent in 1991 (USDHHS 1988a, 1989a, 1991a, 1992a).

The reduction in the late 1980s may be attributed to increased awareness resulting from several events: (1) the much-publicized Sean Marsee case, in which a star high school athlete who used snuff died of oral cancer (Fincher 1985); (2) the 1986 convening of a major national conference on smokeless tobacco use and the 1986 release of a report by the Advisory Committee to the Surgeon General on smokeless tobacco (*Journal of the American Medical Association* 1986; USDHHS 1986); (3) the introduction in 1986 of health warnings on smokeless tobacco packages and advertising; and (4) the enactment in 1986 of a ban on the advertising of smokeless tobacco products through the electronic media (USDHHS 1989b, 1992b).

The overall national prevalence estimates for current smokeless tobacco use (within the 30 days preceding the survey) were 3 percent for past-month users among persons 12 through 18 years old surveyed in the 1991 NHSDA (reflecting about 800,000 users), 11 percent for high school seniors in the 1992 MTFP survey, and 11 percent for students in grades 9–12 in the 1991 YRBS (Table 34). Current use was substantially more prevalent among males than females; 6 percent of the males in the NHSDA and 20 percent of the males in the other two surveys reported current use, whereas only about 1 percent of the females in the three surveys reported current use. Smokeless tobacco use was highest among white males; Hispanic males had the next highest prevalence, and black males had the lowest. Although reliable national data are not currently available on smokeless tobacco use among American Indian and Alaskan Native adolescents, local surveys have reported very high prevalence (e.g., CDC 1987, 1988; Schinke et al. 1987; Hall and Dexter 1988; see also "Sociodemographic Factors in the Initiation of Smokeless Tobacco Use" in Chapter 4).

Smokeless tobacco use increased with increasing age in the NHSDA survey of 12- through 18-year-olds and by grade in the 1992 MTFP survey, but did not change appreciably among students in the four high school grades surveyed by the YRBS.

Individual YRBS surveys conducted in several state and local communities found that male high school students were far more likely than females to use smokeless tobacco (Table 35); nonetheless, smokeless tobacco was used by as much as 10 percent of female respondents in a given state survey. In some states (Alabama, Idaho, South Dakota, Colorado, Wyoming, and Montana), males were as likely to report current smokeless tobacco use as they were to report current cigarette use (see Table 3).

The 1992 MTFP survey gathered data on the frequency of smokeless tobacco use among approximately 2,600 high school seniors (ISR, University of Michigan, unpublished data). Users were classified according to the number of days they had used smokeless tobacco over a period of 30 days. Thirty-eight percent of male users and 20 percent of female users reported that they had used smokeless tobacco at least once every day. Seventy percent of the female users reported that they had used the product less than once each week. Thirty-nine percent of white users and 12 percent of black users reported daily use of smokeless tobacco. Almost 60 percent of the black users reported that they had used the product less than once each week. Among past-month users, 46 percent of those living in the West and 43 percent of those from the South had used smokeless tobacco at least once each day. Thirty-three percent of users who lived in the north-central and 22 percent from the northeast United States used smokeless tobacco on a daily basis.

Use of Smokeless Tobacco and Cigarettes

As was shown in Table 23, 43 percent of male high school seniors who used smokeless tobacco also smoked cigarettes. Tobacco, either in the form of cigarettes or smokeless tobacco, was used by 15 percent of 12- through 18-year-olds in the 1991 NHSDA, 32 percent of high school students in the 1991 YRBS, and 33 percent of high school seniors in the 1992 MTFP (Table 36). Males were substantially more likely than females to use tobacco. Regardless of gender, the prevalence of tobacco use for

Table 34. Percentage of young people who currently (within the past 30 days) use smokeless tobacco, by gender, race/Hispanic origin, age/grade, and region, National Household Surveys on Drug Abuse (NHSDA), Monitoring the Future Project (MTFP), Youth Risk Behavior Survey (YRBS), United States, 1991, 1992

Characteristic	NHSDA[*]	MTFP[†‡]	YRBS[§]
Overall	3.4	11.4	10.5
Gender			
Male	6.0	20.8	19.2
Female	0.6	2.0	1.3
Race/Hispanic origin			
White, non-Hispanic	4.4	13.5	13.0
Male	8.1	23.9	23.6
Female	0.5	2.5	1.4
Black, non-Hispanic	0.7	2.5	2.1
Male	0.5	5.2	3.6
Female	0.8	0.2	0.7
Hispanic	1.2	NA[¶]	5.5
Male	2.1	NA	10.7
Female	0.3	NA	0.6
Age/grade			
12–14 years	1.5		
15–16 years	3.6		
17–18 years	5.9		
8th grade		7.0	
9th grade			9.0
10th grade		9.6	10.1
11th grade			12.1
12th grade		11.4	10.7
Region			
Northeast	0.8	8.2	8.8
North Central	3.9	12.3	13.3
South	4.0	12.5	8.6
West	3.9	11.1	10.5

Sources: **1991 NHSDA**: Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (unpublished data); **1992 MTFP:** Johnston, O'Malley, Bachman (in press); Institute for Social Research, University of Michigan (unpublished data); **1991 YRBS:** CDC (1992c); CDC, Division of Adolescent and School Health (unpublished data).

[*] 1991 NHSDA, aged 12–18 years. Based on response to the question, "When was the most recent time you used chewing tobacco or snuff or other smokeless tobacco?"

[†] 1992 MTFP survey of high school seniors. Based on response to the question, "How frequently have you taken smokeless tobacco during the past 30 days?"

[‡] With the exception of data for 8th- and 10th-grade students, all other data points for the MTFP survey reflect estimates for high school seniors.

[§] 1991 YRBS, grades 9–12. Based on response to the question, "During the past 30 days, did you use chewing tobacco, such as Redman, Levi Garrett, or Beechnut, or snuff, such as Skoal, Skoal Bandits, or Copenhagen?"

[¶] NA = Not available.

Table 35. Percentage of high school students who use smokeless tobacco, by gender, Youth Risk Behavior Surveys, United States and selected U.S. sites, 1991

	Smokeless tobacco use[*]		
Site	**Female**	**Male**	**Total**
Weighted data			
National survey	1	19	10
State surveys			
Alabama	2	31	16
Georgia	2	22	12
Idaho	3	24	14
Nebraska	2	26	14
New Mexico	4	27	16
New York[†]	2	19	11
Puerto Rico[‡]	0	5	2
South Carolina	2	20	11
South Dakota	10	29	20
Utah	2	12	7
Local surveys			
Chicago	2	5	3
Dallas	1	7	4
Fort Lauderdale	1	9	4
Jersey City	1	6	3
Miami	1	6	3
Philadelphia	2	6	4
San Diego	1	7	4
Unweighted data[§]			
State surveys			
Colorado[†]	6	32	19
District of Columbia[‡]	2	5	4
Hawaii	2	14	8
Montana	7	33	20
New Hampshire	4	22	13
New Jersey[†]	2	14	7
Oregon	5	28	16
Pennsylvania[†]	2	29	16
Tennessee	1	34	17
Wisconsin	3	19	11
Wyoming	5	31	19
Local surveys			
Boston	1	5	3
New York City	1	5	3
San Francisco	2	6	4

Source: Centers for Disease Control (1992d).

[*] Respondents used chewing tobacco or snuff on 1 or more of the 30 days preceding the survey.

[†] Surveys did not include students from the largest city.

[‡] Categorized as a state for funding purposes.

[§] Fourteen sites had overall response rates below 60 percent or had unavailable documentation; weighted estimates were not reported.

Table 36. Percentage of young people who currently (within the past 30 days) use cigarettes and/or smokeless tobacco , by gender, race/Hispanic origin, region, and age/grade, National Household Surveys on Drug Abuse (NHSDA), Monitoring the Future Project (MTFP), Youth Risk Behavior Survey (YRBS), United States, 1991, 1992

Characteristic	NHSDA[*]	MTFP[†]	YRBS[‡]
Overall	15.1	33.2	31.8
Gender			
Male	17.1	38.8	35.8
Female	13.0	27.3	27.6
Race/Hispanic origin[§]			
White, non-Hispanic	17.9	38.4	36.2
Male	20.3	43.0	40.0
Female	15.4	33.3	32.0
Black, non-Hispanic	6.0	8.8	13.7
Male	6.6	14.3	16.0
Female	5.4	4.5	11.6
Hispanic	10.9	NA[§]	28.1
Male	10.8	NA	33.6
Female	10.9	NA	23.1
Age/grade			
12–14 years	5.1		
15–16 years	16.2		
17–18 years	28.5		
8th grade		20.5	
9th grade			26.7
10th grade		27.6	29.6
11th grade			36.3
12th grade		33.2	34.7
Region			
Northeast	28.2	35.1	
North Central	17.0	37.7	40.8
South	14.5	30.3	28.8
West	14.2	30.0	27.6

Sources: **1991 NHSDA**: Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (unpublished data); **1992 MTFP:** Johnston, O'Malley, Bachman (in press); Institute for Social Research, University of Michigan (unpublished data); **1991 YRBS**: CDC, Division of Adolescent and School Health (unpublished data).

[*] 1991 NHSDA, aged 12–18 years. Based on responses to the questions, "When was the most recent time you smoked a cigarette?" and "When was the most recent time you used chewing tobacco or snuff or other smokeless tobacco?"

[†] 1992 MTFP surveys of high school seniors. Based on responses to the questions, "How frequently have you smoked cigarettes during the past 30 days?" and "How frequently have you taken smokeless tobacco during the past 30 days?"

[‡] 1991 YRBS, grades 9–12. Based on responses to the questions, "During the past 30 days, on how many days did you smoke cigarettes?" and "During the past 30 days, did you use chewing tobacco, such as Redman, Levi Garrett, or Beechnut, or snuff, such as Skoal, Skoal Bandits, or Copenhagen?"

[§] NA = Not available.

white adolescents was higher than for Hispanics and blacks. Tobacco use increased with increasing age and was most common in the north-central region of the United States.

Sociodemographic Risk Factors for Smokeless Tobacco Use

Current use of smokeless tobacco among male high school seniors varied according to several sociodemographic indicators, as shown by the 1986–1989 MTFP surveys (N [weighted] = 5,277). The prevalence of current smokeless tobacco use was 28 percent among those who lived alone, 29 percent among those living in father-only households, 16 percent among those living in mother-only households, and 20 percent among those living with both parents. Current use was more common among male seniors living on farms (34 percent) and in the country (31 percent) than among those living in medium-sized to very large cities or suburbs (11 to 17 percent). The prevalence of current use was greater among students who rated their academic performance as average (25 percent) or below average (26 percent) than among those who rated their performance as slightly above average (18 percent) or far above average (16 percent). Smokeless tobacco use was more common among male seniors who planned to enter the armed forces after high school than among those who did not have such plans (23 vs. 19 percent). The self-reported importance of religion did not affect the prevalence of smokeless tobacco use among these MTFP seniors.

Grade When Smokeless Tobacco Use Begins

The grade distribution for which MTFP seniors reported first trying smokeless tobacco was more similar to that reported for cigarettes than it was for those reported for alcohol, marijuana, and cocaine (Figure 8). Among seniors who had used smokeless tobacco, 23 percent had first done so by grade six, 53 percent by grade eight, and 73 percent by the ninth grade.

Attempts to Quit Using Smokeless Tobacco

Twenty-two percent of the male high school seniors in the 1986–1989 MTFP who had regularly used smokeless tobacco reported that they had not used the product during the 30 days preceding the survey. In the 1986–1989 TAPS, 12- through 18-year-olds who regularly used smokeless tobacco were asked to report the number of times they had tried to quit. Nineteen percent of males and 14 percent of females reported never making a quit attempt. Thirty-three percent of males and 72 percent of females had made one attempt to quit, 27 percent of males and 14 percent of females had tried quitting two or three times, and 21 percent of males and no females had tried to quit four or more times (1989 TAPS, CDC, OSH, unpublished data).

Smokeless Tobacco Brand Preference

TAPS also asked those who had regularly used smokeless tobacco what brand they usually bought. Among males in this subgroup (N = 300), 38 percent usually bought Copenhagen, 26 percent purchased Skoal or Skoal Bandits, 9 percent purchased Redman, 6 percent bought Levi Garrett, 2 percent purchased Beechnut, and 19 percent purchased other smokeless tobacco brands (1989 TAPS, CDC, OSH, unpublished data).

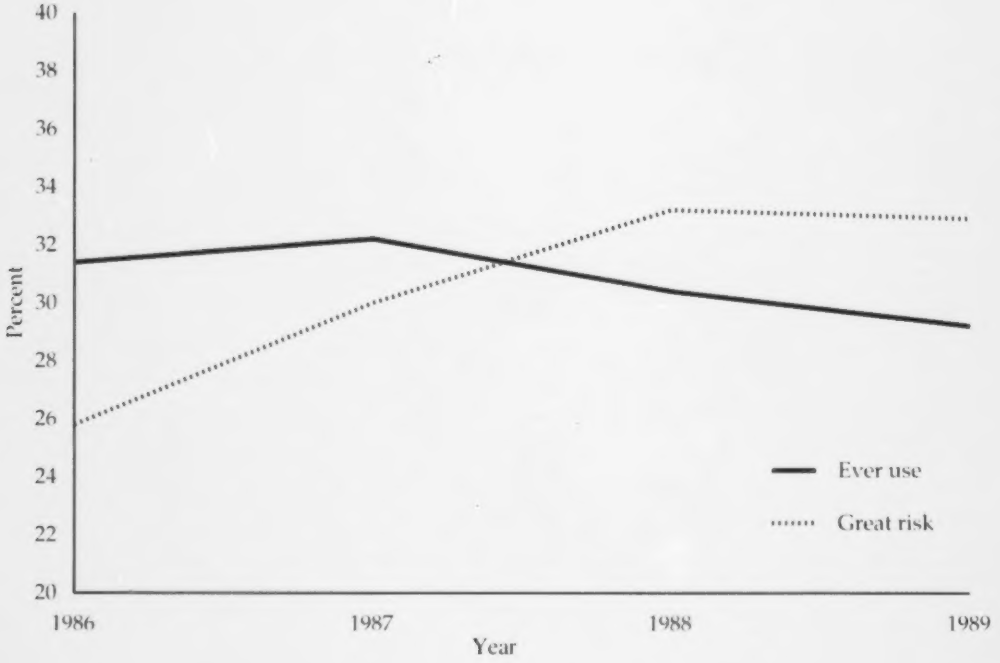
Trends in Perceived Health Risks of Smokeless Tobacco Use

High school seniors in the MTFP were asked, "How much do you think people risk harming themselves (physically or in other ways) if they use smokeless tobacco regularly (chewing tobacco, plug, dipping tobacco, snuff)?" Overall in 1991, 37 percent reported that great risk of harm is associated with smokeless tobacco use (ISR, University of Michigan, unpublished data); more females (43 percent) than males (32 percent) and more blacks (44 percent) than whites (36 percent) were of this opinion. Western respondents more frequently held this belief (43 percent) than respondents in the South (37 percent), the Northeast (36 percent), and the north-central United States (35 percent). Respondents who planned to attend college for four years were more likely to report this belief than those without college plans (39 vs. 33 percent).

When the overall percentage of seniors in the 1986–1989 MTFP who believed that great risk is associated with smokeless tobacco use is plotted against the percentage of seniors who had used smokeless tobacco, the trends of these percentages are inversely related (Figure 9). Between 1986 and 1988, the percentage of seniors who believed that great risk is associated with smokeless tobacco use increased from 26 to 33 percent. Between 1988 and 1989, this percentage remained relatively stable. The percentage of seniors who had used smokeless tobacco increased slightly between 1986 (31 percent) and 1987 (32 percent) and decreased by 1989 (29 percent). This finding is similar to that observed for cigarette smoking (Figure 5).

In the 1989 TAPS, 94 percent of 12- through 18-year-old males reported that use of chewing tobacco and snuff can cause cancer. Ninety-three percent of those males who had never used smokeless tobacco and 96 percent of those who had regularly used the product endorsed that statement (Allen et al. 1993).

Figure 9. Trends in the percentage of high school seniors who believe that regular use of smokeless tobacco is a serious health risk and who have ever used smokeless tobacco, Monitoring the Future Project, United States, 1986–1989



Sources: Bachman, Johnston, O'Malley (1987, 1991); Johnston, Bachman, O'Malley (1991, 1992).

Smokeless Tobacco Use and Other Drug Use

Prevalence of Smokeless Tobacco Use and Other Drug Use

The majority of male high school seniors in the 1986–1989 MTFP who used alcohol, marijuana, cocaine, or inhalants did not use smokeless tobacco (Table 37). Smokeless tobacco use, however, was from 1.5 to 3.9 times higher among users of these drugs than among nonusers. Most notably, 90 percent of smokeless tobacco users were also alcohol drinkers. Almost one-third (31 percent) of smokeless tobacco users also used marijuana, 7 percent used cocaine, and 5 percent used inhalants. The prevalence of other drug use was from 1.4 to 1.9 times greater among smokeless tobacco users than nonusers.

Grade When Use of Smokeless Tobacco and Cigarettes Begins

In the 1986–1989 MTFP, 28 percent of all males had never tried cigarettes or smokeless tobacco by the 12th grade; 44 percent had tried both; 18 percent had tried cigarettes but not smokeless tobacco; and 9 percent had tried smokeless tobacco but not cigarettes (Table 38). Of those male seniors who had tried both, 37 percent had tried cigarettes before smokeless tobacco, 24 percent had tried smokeless tobacco before cigarettes, and 40 percent had first tried both at about the same time.

Smokeless Tobacco Use and Other Health-Related Behaviors

In the 1991 YRBS, male high school students were more likely to report past-month use of smokeless tobacco if they rarely or never wore seat belts, were frequently involved in physical fights, carried weapons during one or more of the preceding 30 days, and had made one or more suicide attempts during the preceding 12 months (Table 27). These students were also more likely to currently use smokeless tobacco if they had ever had sexual intercourse (Table 28). Smokeless tobacco use did not vary appreciably (compared with cigarette smoking)

Table 37. Prevalence (%) of smokeless tobacco use among users of other drugs and prevalence of other drug use among smokeless tobacco users,* male high school seniors, Monitoring the Future Project, United States, 1986–1989

Other drugs	Prevalence of smokeless tobacco use among users of other drugs	Prevalence of smokeless tobacco use among nonusers of other drugs	Prevalence of other drug use among smokeless tobacco users	Prevalence of other drug use among nonusers of smokeless tobacco
Alcohol	26.3	6.8	89.6	63.8
Marijuana	27.6	17.6	30.9	20.0
Cocaine[†]	28.7	19.6	7.4	4.6
Inhalants[‡]	32.3	19.6	5.0	2.6

Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

*Any use of smokeless tobacco or other drugs during the past month.

[†] Includes "coke," "crack," and "rock."

[‡] Glue, aerosols, laughing gas, etc.

Table 38. Percent distribution of male high school seniors (N [weighted] = 4,254), by grade in which they first used cigarettes and smokeless tobacco (used in the past 30 days), Monitoring the Future Project (MTFP), United States, 1986–1989

	Grade when respondent first tried smokeless tobacco							
Grade when respondent first tried cigarettes	≤ 6	7–8	9	10	11	12	Never used	Row total
≤ 6	7.1	4.9	2.3	1.4	0.7	0.3	5.8	22.4
7–8	2.1	5.8	2.5	1.3	0.8	0.3	4.7	17.5
9	1.3	2.0	2.3	0.9	0.4	0.2	3.2	10.3
10	0.6	0.7	1.0	1.5	0.2	0.1	2.3	6.4
11	0.1	0.5	0.7	0.5	0.5	0.1	1.5	3.9
12	*	0.3	0.2	0.1	0.1	0.3	0.9	1.9
Never used	2.0	2.7	1.9	1.1	1.3	0.2	28.3	37.6
Column total	13.3	16.9	11.0	6.9	4.0	1.4	46.7	100.0

Source: Centers for Disease Control and Prevention, Office on Smoking and Health (unpublished data).

* < 0.05.

Note: Totals may not equal the sum of individual percentages because of rounding.

by how many lifetime sexual partners these males had had or by whether they had used a condom during their most recent sexual intercourse. Lastly, students were consistently more likely to currently use smokeless tobacco if they had participated on a sponsored sports team (Table 29). This finding is opposite to that found for cigarette smoking and sports. Smokeless tobacco use was also more likely among students who had used steroids without a doctor's prescription.

Conclusions

1. Tobacco use primarily begins in early adolescence, typically by age 16; almost all first use occurs before the time of high school graduation.
2. Smoking prevalence among adolescents declined sharply in the 1970s, but the decline slowed significantly in the 1980s. At least 3.1 million adolescents and 25 percent of 17- and 18-year-olds are current smokers.
3. Although current smoking prevalence among female adolescents began exceeding that among males by the mid- to late-1970s, both sexes are now equally likely to smoke. Males are significantly more likely than females to use smokeless tobacco. Nationally, white adolescents are more likely to use all forms of tobacco than are blacks and Hispanics. The decline in the prevalence of cigarette smoking among black adolescents is noteworthy.
4. Many adolescent smokers are addicted to cigarettes; these young smokers report withdrawal symptoms similar to those reported by adults.
5. Tobacco use in adolescence is associated with a range of health-compromising behaviors, including being involved in fights, carrying weapons, engaging in higher-risk sexual behavior, and using alcohol and other drugs.

Appendix 1. Sources of Data

National Teenage Tobacco Surveys and Teenage Attitudes and Practices Survey

The U.S. Public Health Service (primarily OSH, which was formerly called the National Clearinghouse for Smoking and Health) and the U.S. Department of Education collected data on cigarette smoking patterns among teenagers (aged 12 through 18) in 1968, 1970, 1972, 1974, and 1979 (USDHEW 1972, 1976, 1979b) and on teenage use of cigarettes and smokeless tobacco in 1989 (Allen et al. 1991, 1993; Moss et al. 1992). These surveys are referred to collectively as the National Teenage Tobacco Surveys. All six surveys were conducted via telephone. (In 1968, results from in-person interviews conducted in households without telephones indicated that the exclusion of such households would not significantly influence the data obtained from the telephone sample [USDHEW 1972].) However, the 1989 survey, often referred to as the Teenage Attitudes and Practices Survey, mailed questionnaires to those persons in the sample who could not be reached by telephone (Allen et al. 1991, 1993; Moss et al. 1992). (See Table 1 for sample sizes, types of surveys, response rates, ages, and sponsoring agencies.)

The response rate was reported only for the 1989 survey (82 percent) (Allen et al. 1991, 1993). Estimates from the 1968–1979 NTTS were based on unweighted data; those from the TAPS incorporated survey design and post-stratification weights. Because of differences in sampling, weighting, and interviewing procedures, the 1989 survey cannot be readily compared with the earlier surveys.

TAPS is ongoing. TAPS II, which included a national longitudinal component, was conducted in spring 1993; data were not available for this report.

National Household Surveys on Drug Abuse

Since 1974, NIDA has conducted periodic household surveys (the NHSDA) of the civilian, noninstitutionalized population of persons aged 12 and older. These surveys are now sponsored by SAMSHA. Published data are available from surveys conducted by NIDA for the years 1974, 1976, 1977, 1979, 1982, 1985, 1988, 1990, and 1991 (Abelson and Atkinson 1975; Abelson and Fishburne 1976; Fishburne, Abelson, Cisin 1980; Miller et al. 1983; USDHHS 1988a, 1990a, 1991a, 1992a).

Multistage sampling designs were used to randomly sample households in the 48 contiguous states; the 1991 survey also included Alaska and Hawaii (USDHHS 1992a). Respondents were interviewed in their homes by trained personnel. The response rate averaged 80 percent (Gfroerer 1993), and the data were weighted to provide national estimates. For all years except 1979, "ever smokers" were defined as persons who reported having tried a cigarette, and "current smokers" were defined as persons who had smoked within the past month. For 1979, only persons who reported having smoked five or more packs of cigarettes in their lifetime were asked if they were current smokers; direct comparison with other NIDA surveys is thus problematic. The results of the 1982 survey have been used to adjust the 1979 prevalence estimates to be more comparable with other years. From 1974 through 1982, race information was categorized as either white or races other than white; from 1985 through 1991, this information was categorized as white, black, and other (Abelson and Atkinson 1975; Abelson and Fishburne 1976; Fishburne, Abelson, Cisin 1980; Miller et al. 1983; USDHHS 1988a, 1990a, 1991a, 1992a). Patterns of use identified by the 1991 survey are described for persons 12 through 18 years old. In addition, the initiation patterns of persons 30 through 39 years of age are used to estimate the percentage of people who initiate smoking after 18 years of age. Since 1988, the NHSDA has also collected data on smokeless tobacco use.

The NHSDA is conducted annually; 1992 data were not available for this report.

Monitoring the Future Project Surveys

The University of Michigan's ISR, under grants from NIDA, has surveyed nationally representative samples of high school seniors in the spring of each year since 1975 as part of the MTFP. In 1991 and 1992, 8th- and 10th-grade students were also surveyed. This report includes analyses from published or in-press data from 1976 through 1992 (Bachman, Johnston, O'Malley 1980a, b, 1981, 1984, 1985, 1987, 1991; Bachman et al. 1991; Johnston, Bachman, O'Malley 1980a, b, 1982, 1984, 1986, 1991, 1992; Johnston, O'Malley, Bachman 1992a, 1992), from unpublished data for 1989 through 1992 (ISR, University of Michigan, unpublished data), and from analyses of public-use computer tapes for the 1976–1989 surveys (CDC, OSH, unpublished data). The data from 1975 were not included in this report, because a computer tape was not available for 1975 and because the response rate was much lower and the sample size much smaller than in subsequent years (Johnston and Bachman 1980). A multistage sampling design is used to randomly select high school seniors in public and private schools within the 48 contiguous states. Self-administered standardized questionnaires are provided by trained personnel to students in their classrooms. From 125 to 135 high schools are selected each year. From 66 percent to 80 percent of selected schools have participated, and 77 percent to 86 percent of sampled seniors have participated (nearly all nonparticipation has been due to absenteeism) (Johnston, O'Malley, Bachman 1991a). The data are weighted to provide national estimates, and approximately 16,000 completed interviews are obtained each year.

For this report, longitudinal analyses were also conducted by using panel data from nationally representative samples of the senior classes of 1976 through 1986. These students were then followed up five to six years after high school, from 1981 through 1991, when the respondents were 23 to 24 years old (Johnston, O'Malley, Bachman 1992b). Data from 11 classes were combined to produce an adequate sample size for analysis, yielding a total of 13,665 respondents. Of those students sampled, a random fifth received a question regarding their future expectations to smoke. From 70 to 80 percent of the surveyed seniors remained in the panel five years later (Johnston, O'Malley, Bachman 1991b).

The MTFP collected information on the prevalence of smokeless tobacco use from 1986 through 1989, and again in 1992. MTFP data are collected annually; 1993 data were not available for this report.

Youth Risk Behavior Survey

CDC developed the Youth Risk Behavior Surveillance System to measure six categories of priority health-risk behaviors among adolescents: (1) behaviors that contribute to unintentional and intentional injuries; (2) tobacco use; (3) alcohol and other drug use; (4) sexual behaviors that result in unintended pregnancy and sexually transmitted disease, including HIV infection; (5) unhealthful dietary behaviors; and (6) physical inactivity. Data were collected through national, state, and local school-based surveys of high school students during the spring of odd-numbered years and through a 1992 national household-based survey of youths aged 12 through 21 (Kolbe 1990; Kolbe, Kann, Collins 1993). Only the 1991 state and local data are used in this report. The 1991 national school-based YRBS used a three-stage cluster sample design. The target population consisted of all public and private school students in grades 9 through 12 in the 50 states and the District of Columbia. Schools with substantial numbers of black and Hispanic students were sampled at relatively higher rates than all other schools.

Survey procedures were designed to protect student privacy and allow anonymous participation. The 75-item questionnaire was administered in the classroom by trained data collectors, and students recorded responses on answer sheets designed for scanning by computer. Parental notification was completed before survey administration. The school response rate was 75 percent, and the student response rate was 90 percent. A total of 12,272 students completed questionnaires in 137 schools. The data were weighted to provide national estimates of 9th- through 12th-grade students.

In addition to the 1991 national YRBS, individual surveys were conducted that year among samples of high school students by 23 state and 10 local departments of education. CDC reports weighted data when the overall (school and student) response rates are at least 60 percent (CDC 1992d). Nine questions on the survey measured tobacco use. These questions addressed experimentation with cigarette smoking, age at initiation of cigarette smoking, regular use of cigarettes, age at initiation of regular cigarette smoking, number of days cigarettes were smoked during the previous 30 days, number of cigarettes smoked per day, number of attempts to quit smoking, and use of smokeless tobacco.

YRBS data are collected every odd year at both the national and local levels; 1993 data were not available.

To provide greater access to youths who do not attend school, the CDC and the Bureau of the Census incorporated a Youth Risk Behavior Supplement to the 1992 National Health Interview Survey. The supplement was conducted among 12- through 21-year-old youths from a national probability sample of households. School-age youths not attending school were oversampled.

The questionnaire for this survey was administered through individual portable cassette players with earphones; after listening to questions, respondents marked their answers on standardized answer sheets. This methodology should help young people with reading problems to complete the survey and should enhance confidentiality during household administration (Kolbe, Kann, Collins 1993). Data from this survey were not available for this report.

National Health Interview Surveys

To determine cigarette smoking trends among older adolescents (aged 18 and 19), this analysis used data from NHIS from 1974, 1978, 1979, 1980, 1983, 1985, 1987, 1988, 1990, and 1991 (NCHS 1985, 1988a, b; CDC, OSH, unpublished data). Since 1957, NCHS has been collecting health data from a probability sample of the civilian, noninstitutionalized adult population of the United States (NCHS 1958, 1975, 1985, 1989). For the serial cross-sectional analyses, data from surveys conducted during or after 1974 are used to eliminate proxy reports from the comparisons. In 1985, the sample design was changed to produce more precise estimates for blacks by oversampling. Most interviews were conducted in the home; when respondents could not be interviewed in person, telephone interviews were conducted. The sample was then poststratified by age, gender, and racial distribution of the U.S. population for the survey year and weighted to provide national estimates. The overall NHIS response rate for surveys on smoking is at least 85 percent (NCHS 1985, 1988a, b; CDC, OSH, unpublished data).

In other analyses, trends in the reconstructed prevalence of cigarette smoking among persons 10 through 19 years old are reported using data from the 1970, 1978, 1979, 1980, and 1987 surveys (USDHHS 1992a). In addition, age at initiation of regular smoking is reported for respondents to the 1970, 1978, 1979, 1980, 1987, and 1988 surveys. The 1978, 1979, and 1980 surveys collected information on usual brand smoked; these data are reported for 18- and 19-year-old respondents. The 1970 NHIS also collected data on smokeless tobacco use among persons 17 through 19 years old.

NHIS data on smoking are collected annually, until at least 1995.

Appendix 2. Measures of Cigarette Smoking

As is documented in Chapter 4 of this report (see "Developmental Stages of Smoking") and in the 1989 Surgeon General's report on smoking and health (USDHHS 1989b), the development of a pattern of daily smoking occurs in several stages over time. Several measures can be derived from the national surveys to capture patterns of tobacco use among young people (Table 39).

Ever Smoking

Four surveys—TAPS, the NHSDA, the MTFP, and the YRBS—have comparable definitions of ever smoking. In TAPS and the YRBS, ever smokers are those who have tried even a few puffs of a cigarette. In the NHSDA, respondents who report having tried a cigarette are classified as ever users. In the MTFP, respondents who report having smoked at least once or twice are classified as ever smokers. Published reports of the 1968–1979 NTTS merge never smokers and experimenters (those who have smoked at least a few puffs, but not as many as 100 cigarettes) into one category (USDHEW 1972, 1976, 1979b); thus, the NTTS trend information on ever smoking for those years underestimates the actual prevalence of ever smoking.

Current Smoking

For TAPS, the NHSDA, the MTFP, and the YRBS, current usage patterns are defined as any use of cigarettes within the 30 days preceding the survey. For the 1968–1979 NTTS, current occasional smokers are defined as those who smoke less than one cigarette a week, and current regular smokers are those who smoke one or more cigarettes per week or one or more per day (USDHEW 1972, 1976, 1979b). In this chapter, current regular and current occasional smokers are combined into one category.

The NHIS defines current smokers as those respondents who have smoked at least 100 cigarettes and who answer "yes" to the question, "Do you smoke cigarettes now?" NHIS data on age at initiation of regular smoking and on duration of abstinence for former smokers have been used to reconstruct the prevalence of cigarette smoking for the decades in this century before systematic surveillance of cigarette smoking was conducted (USDHHS 1991b). Using information on a respondent's date of birth, age at initiation of smoking, and age at cessation (for former smokers), the smoking status of a respondent can be assessed for any given year. Similar analyses have been reported in previous Surgeon General's reports (USDHHS 1980, 1985) and in the published literature (Harris 1983; Escobedo and Remington 1989; Pierce, Naquin, et al. 1991). For this report, the reconstructed prevalence of smoking among those aged 10 through 19 years is reported for the years 1920–1980. These data are subject to recall bias; for some respondents, more than 50 years separated the year they were being surveyed and the recalled year they began smoking regularly.

Table 39. Smoking among young people in the United States—sources of national data, definitions of use, 1968–1991

Source	Ever smoking	Age/grade when respondent first tried smoking	Current smoking status
National Teenage Tobacco Surveys (NTTS) and 1989 Teenage Attitudes and Practices Survey (TAPS)	Any smoking, even a few puffs (TAPS); smoke now or have smoked at least 100 cigarettes (for trends, 1968–1979)	Age when smoked first whole cigarette	Smoke now (1968–1979); any smoking during the past 30 days (TAPS); number of days smoked during the past 30 days (TAPS)
National Household Surveys on Drug Abuse (NHSDA)	Ever tried a cigarette; ever smoked daily	Age when first tried a cigarette; age when first started smoking daily	Any smoking during the past 30 days
Monitoring the Future Project (MTFP)	Smoked cigarettes at least once or twice	Grade when smoked first cigarette; grade when first smoked on a daily basis	Any smoking during the past 30 days
Youth Risk Behavior Survey (YRBS)	Any smoking, even one or two puffs; ever smoked regularly (at least one cigarette every day for 30 days)	Age when first smoked a whole cigarette; age when first started smoking regularly (at least one cigarette every day for 30 days)	Any smoking during the past 30 days; number of days smoked during the past 30 days
National Health Interview Surveys (NHIS)	Smoked at least 100 cigarettes in entire life	Age when first started smoking cigarettes fairly regularly	Smoke cigarettes now; reconstructed prevalence of smoking

Sources: **NTTS**: U.S. Department of Health, Education, and Welfare (1972, 1976, 1979b); **TAPS**: Allen et al. (1991, 1993); Moss et al. (1992); **NHSDA**: Abelson and Atkinson (1975); Abelson and Fishburne (1976); Fishburne, Abelson, Cisin (1980); Miller et al. (1983); U.S. Department of Health and Human Services [USDHHS] (1988a, 1990a, 1991a, 1992a, 1993); **MTFP**: Bachman, Johnston, O'Malley (1980a, b, 1981, 1984, 1985, 1987, 1991); Johnston, Bachman, O'Malley (1980a, b, 1982, 1984, 1986, 1991, 1992); Johnston, O'Malley, Bachman (in press); **YRBS**: Kolbe (1990); Centers for Disease Control (1992c, d); **NHIS**: National Center for Health Statistics (1958, 1975, 1985, 1988a, b, 1989); USDHHS (1991b).

*Not all potential sources of data on youth smoking are used in this report.

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Number of cigarettes smoked each day	Lifetime smoking	Former smoking	Steps to improve data validity
Average number of cigarettes smoked per day during the past 7 days (TAPS)	11-item scale (TAPS)	No smoking during the past 30 days among respondents who have smoked at least 100 cigarettes (TAPS); quit attempts during the previous 6 months (TAPS)	Assured confidentiality
Average number of cigarettes smoked per day during the past 30 days	*	*	Assured confidentiality
Average number of cigarettes smoked per day during the past 30 days	5-item scale 6-item scale	No smoking during the past 30 days among people who have ever smoked regularly; interest in quitting; difficulty quitting	Assured confidentiality
Average number of cigarettes smoked on the days smoked during the past 30 days	*	*	Assured anonymity
*	*	Does not smoke cigarettes now; length of time since last smoked cigarettes regularly	Assured confidentiality

Frequent and Heavy Smoking

Measures of more frequent or heavy use are available from four of the surveys. In TAPS and the YRBS, the reported number of days smoked in the previous 30 days is used to describe the frequency of use. For this report, frequent smoking is defined as smoking on 20 of the 30 days preceding the survey. The MTFP asks respondents how frequently they have smoked during the previous 30 days. Possible responses are "not at all," "less than one cigarette per day," "one to five cigarettes per day," "about one-half pack per day," "about one pack per day," "about one and one-half packs per day," and "two packs or more per day." The NHSDA uses a similar question with similar response categories to classify use within the previous 30 days. For this report, heavy smoking is defined as smoking at least one-half pack of cigarettes per day. MTFP participants who responded that they smoked at least one to five cigarettes

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per day have been classified traditionally as "daily" smokers (USDHHS 1989b; Johnston, O'Malley, Bachman 1991a) and are so classified in this report. However, some persons who average one or more cigarettes per day during a given month may not have smoked on every day of that month.

Age or Grade When Smoking Begins

Age at initiation is measured as the age when a respondent first tried a cigarette (NHSDA), smoked the first whole cigarette (TAPS, YRBS), first became a daily smoker (YRBS, NHSDA), or started smoking fairly regularly (NHIS). The MTFP records the school grades in which the respondent first smoked a cigarette and first smoked on a daily basis. The NHIS measure of the age when the respondent first started smoking fairly regularly can be used to estimate the percentage of adults who became regular smokers during their adolescent years.

Number of Cigarettes Smoked Each Day

Besides inquiring about the average number of cigarettes smoked during the 30 days preceding the survey, TAPS asks respondents to report the number of cigarettes smoked on each of the seven days preceding the survey. The YRBS, on the other hand, determines the average number of cigarettes smoked on the days cigarettes were smoked during the previous 30 days.

Lifetime Patterns of Smoking

The MTFP asks participants if they have ever smoked cigarettes. The response categories ("never," "once or twice," "occasionally, but not regularly," "regularly in the past," and "regularly now") can be used to summarize lifetime patterns of use. To assess the relationship between cigarette smoking and various health status indicators, a five-item scale is used: never smoked cigarettes or smoked once or twice; smoked occasionally, but never regularly; smoked regularly in the past, but not in the previous 30 days; smoke regularly now and began daily smoking in grades 10 through 12; and smoke regularly now and began daily smoking before grade 10.

A more detailed initiation continuum can be defined through responses to three TAPS questions that measure the likelihood of smoking in the future. Respondents who have never tried cigarette smoking are asked, "Do you think you will try a cigarette soon?" Respondents who have never smoked and respondents who have had only a few puffs of a cigarette are asked, "If one of your best friends were to offer you a cigarette, would you smoke it?" All respondents are asked, "Do you think you will be smoking cigarettes one year from now?" By using responses to these questions on perceived susceptibility to smoking in the future and by using responses to other questions on current smoking patterns, one can construct an uptake continuum that records how likely the respondent is to become a smoker and whether or not a person has tried smoking, smoked a whole cigarette, smoked 100 cigarettes, smoked at all in the past 30 days, and smoked on 20 or more of the past 30 days.

Attempts to Quit Smoking

For the MTFP, Johnston, O'Malley, and Bachman (1991a) have defined "noncontinuance" as no smoking during the past 30 days among high school seniors who report that they have smoked regularly. The MTFP also measures interest in quitting ("Do you want to stop smoking now?") and difficulty in quitting ("Have you ever tried to stop smoking and found that you couldn't?"). TAPS respondents who have smoked at least 100 cigarettes and have not smoked in the past 30 days can be considered former smokers. TAPS also records how many times a smoker has tried to quit during the previous six months.

Validity of Measures of Smoking

Smoking patterns among youth are most frequently assessed through self-reported data. However, because smoking is not considered a socially desirable behavior for youth, especially among parents regarding their own children's smoking, young people may not report honestly. Various survey methods thus try to improve the validity of self-reported data. Factors that may influence this validity include (1) the survey setting (e.g., at school or at home), (2) the survey method (e.g., self-administered questionnaire, in-person interview, or telephone interview), (3) the use of the "bogus pipeline" manipulation, described later, and (4) the degree of anonymity available to the respondent.

Home- or telephone-based surveys might be expected to yield higher estimates of adolescent smoking than school-based surveys, since nonschool surveys are much more likely to include chronic absentees and dropouts—groups known to have dramatically higher levels of smoking (Pirie, Murray, Luepker 1988; CDC 1991a). On the other hand, the greater anonymity afforded by self-administered, school-based surveys might yield higher estimates of adolescent smoking than face-to-face or telephone interviews. Because few studies have considered survey setting independent of the survey method, however, these two issues are considered together.

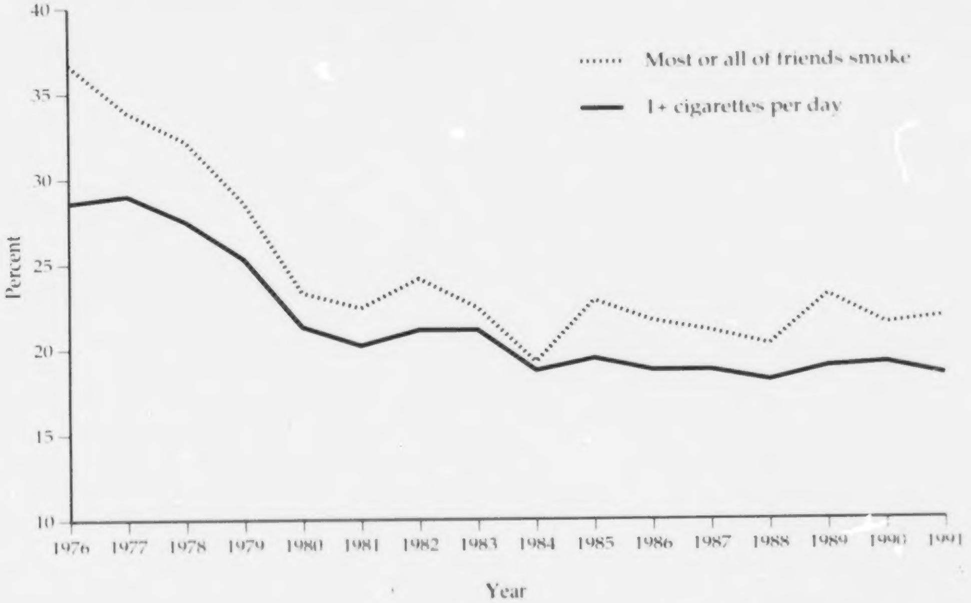
Zanes and Matsoukas (1979) first reported that compared with school surveys, home surveys measurably underreported smoking, though the underreporting was largely limited to students who were frequently absent. Turner, Lessler, and Devore (1992) found that past-month smoking prevalence among 12- through 17-year-olds were 10 to 30 percent higher if the self-administered version of the NHSDA home survey was used. These investigators attributed their finding to the lack of privacy that is often found in interviewer-administered home surveys. Luepker et al. (1989) attempted to improve the efficiency of the home survey by using telephone interviews rather than face-to-face interviews, but found that the telephone method underestimated smoking rates by 10 to 15 percent among 17- through 21-year-olds. Comparison of the surveys reported in this chapter suggests that home-based interviews (whether face-to-face or by telephone) are more likely to underestimate smoking than school-based, self-administered questionnaires. For example, for persons 17 and 18 years old, past-month smoking prevalence was estimated to be 28 percent in the 1989 TAPS (telephone home interviews) and 26 percent in the 1991 NHSDA (face-to-face home interviews); the prevalence for the same age group was 30 percent in the 1991 YRBS and 28 percent in the 1991 MTFP (both school-based, self-administered questionnaires). All four studies had high and comparable participation rates and were weighted to provide national estimates. Of 17- and 18-year-olds who remained in school and participated in the 1989 TAPS, 23 percent smoked in the past month. Despite the differences in reporting, surveys using home interviews complement school-based surveys and provide access to a population that is not available at school. Most notable, however, is the similarity of the patterns of tobacco use across all of the surveillance systems.

Substantial work to improve the validity of self-reported data has been limited largely to surveys that use school-based, self-administered questionnaires. Among these efforts has been the development of the "bogus pipeline" approach (Jones and Sigall 1971) to school-based surveys, first introduced to cigarette smoking research by Evans, Hansen, and Mittelmark (1977). The approach has two components: (1) subjects must be told that the investigator has a biochemical test that will accurately assess a respondent's smoking patterns, and (2) this test must be administered (or the biological specimen must be collected) when the usual self-reported data are collected. Several legitimate biochemical tests have been used, including measuring carbon monoxide in expired air and measuring thiocyanate or cotinine in saliva. Generally, tests measuring nicotine and cotinine levels have higher sensitivity and specificity—as well as higher cost—than tests measuring carbon monoxide and thiocyanate (e.g., Bauman et al. 1989; Biglan et al. 1985; Etzel 1990; Fears et al. 1987; Jarvis et al. 1987, 1988; Noland et al. 1988; Wall et al. 1988). Sensitivity to these measures increases with age, since as adolescents become older, smoking becomes both more regular and—because it also becomes more socially acceptable—more likely to have occurred shortly before a test is administered. The bogus pipeline procedure has been generally associated with an increase in the percentage of adolescents who report smoking (Murray and Perry 1987), but this has not been shown uniformly (Campanelli, Dielman, Shope 1987; Hill, Dill, Davenport 1988; Werch et al. 1987). The procedure may also have the negative effect of reducing rapport with adolescents by implying that the interviewer does not trust the respondent to be honest (Velicer et al. 1992).

None of the surveillance systems described in this chapter used the bogus pipeline procedure. However, the care that all of the surveillance systems took to assure respondents of confidentiality or anonymity may have attenuated the potential for underreporting. Other possible causes of differences in estimates among systems are the varied composition of the samples (including which schools and households participated in the studies) and the varied wording of questions used in the surveys (Converse and Traugott 1986).

Although underreporting will influence a point estimate of prevalence, trends are likely to be consistent if the survey methodology (and thus any underreporting) remains constant over time. Changes in the social acceptability of smoking and in attitudes towards smoking behavior are factors that across time may differentially affect self-reports (USDHHS 1989b). However, MTFP data can be used to compare the trends of self-reported cigarette smoking prevalence with the high school seniors' reports of use by their friends, a measure for which there should be little reason to underreport. The trend in the percentage of seniors who report that most or all of their friends smoke is similar to the trend for self-reported prevalence, particularly over the past 10 years (Figure 10). These comparable trends hold for males and females and for whites and blacks (Bachman, Johnston, O'Malley 1980a, b, 1981, 1984, 1985, 1987, 1991; Johnston, Bachman, O'Malley 1980a, b, 1982, 1984, 1986; 1991, 1992; ISR, University of Michigan, unpublished data).

Figure 10. **Self-reported prevalence of smoking one or more cigarettes per day during the past month and reported prevalence of smoking among friends, high school seniors, Monitoring the Future Project, United States, 1976–1991**



Sources: Bachman, Johnston, O'Malley (1980a, 1981, 1984, 1985, 1987, 1991); Johnston, Bachman, O'Malley (1980a, b, 1982, 1984, 1986, 1991, 1992); Institute for Social Research, University of Michigan (unpublished data).

Appendix 3. Measures of Smokeless Tobacco Use

Although little research has focused on how smokeless tobacco use develops from trial use to current use, it is probable that, like smoking, smokeless tobacco use occurs over time and in multiple stages. Several measures can be derived from the national surveys to describe this process (see Table 40).

Ever Use of Smokeless Tobacco

TAPS, the NHSDA, and the MTFP include questions on initial (and thus "ever") use of smokeless tobacco. TAPS asks respondents whether they have ever tried using chewing tobacco or snuff. The NHSDA asks how recently respondents have used chewing tobacco or snuff or other smokeless tobacco; "never used smokeless tobacco in lifetime" is a precoded response category. In the MTFP, respondents are asked, "Have you ever taken or used smokeless tobacco (snuff, plug, dipping tobacco, chewing tobacco)?" Respondents who report that they have taken or used smokeless tobacco at least "once or twice" are classified as ever users.

Current Use of Smokeless Tobacco

Current use of smokeless tobacco is assessed in the MTFP, the NHSDA, and the YRBS. Any reported use of smokeless tobacco in the 30 days preceding the survey has been classified in this report as "current use." Because TAPS creates a subcategory of current regular use from the category of respondents who have ever used smokeless tobacco regularly, this report does not use TAPS data to assess the current use of smokeless tobacco.

Table 40. Smokeless tobacco use among young people in the United States — sources of national data, definitions of use, and measures of use, 1989–1991

Source	Ever use of smokeless tobacco	Age/grade when respondent first used smokeless tobacco	Current smokeless tobacco use	Former use of smokeless tobacco	Steps to improve data validity
1989 Teenage Attitudes and Practices Surveys (TAPS)	Ever used chewing tobacco or snuff	Age when first started using	*	Ever regularly used chewing tobacco or snuff, but not now	Assured confidentiality
National Household Surveys on Drug Abuse (NHSDA)	Ever used chewing tobacco or snuff or other smokeless tobacco		Any use of chewing tobacco or snuff or other smokeless tobacco during the past 30 days	*	Assured confidentiality
Monitoring the Future Project (MTFP)	Taken or used smokeless tobacco (snuff, plug, dipping tobacco, chewing tobacco) at least once or twice	Grade when first tried smokeless tobacco (snuff, plug, or chewing tobacco)	Any use of smokeless tobacco during the past 30 days	No smokeless tobacco use during the past 30 days among people who have ever used smokeless tobacco regularly	Assured confidentiality
Youth Risk Behavior Survey (YRBS)			Use of chewing tobacco, snuff, or both during the past 30 days		Assured anonymity

Sources: **TAPS**: Allen et al. (1991, 1993); Moss et al. (1992); **NHSDA**: Abelson and Atkinson (1975); Abelson and Fishburne (1976); Fishburne, Abelson, Cisin (1980); Miller et al. (1983); U.S. Department of Health and Human Services (1988a, 1990a, 1991a, 1992a, 1993); 1991 **NHSDA**: Centers for Disease Control and Prevention (CDC), Office on Smoking and Health (unpublished data); **MTFP**: Bachman, Johnston, O'Malley (1987, 1991); Johnston, Bachman, O'Malley (1991, 1992); Johnston, O'Malley, Bachman (in press); **YRBS**: Kolbe (1990), CDC (1992c, d).

* Not all potential sources of data on youth smokeless tobacco use are used in this report.

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Grade When Smokeless Tobacco Use Begins

The MTFP asks high school seniors to report the school grade, if any, in which they first tried smokeless tobacco, including snuff, plug, or chewing tobacco.

Attempts to Quit Using Smokeless Tobacco

In the MTFP, former smokeless tobacco users are defined as respondents who ever used smokeless tobacco regularly but who have not used smokeless tobacco in the past 30 days. TAPS provides information on the number of times current and former smokeless tobacco users have tried to quit.

Validity of Measures of Smokeless Tobacco Use

Literature is sparse on the use of biochemical markers to assess the validity of self-reported use of smokeless tobacco, and the few studies available are inconsistent. Cohen et al. (1988) reported that the use of a bogus pipeline before collecting self-reported data on smokeless tobacco use among a sample of 282 male seventh- and eighth-grade students resulted in self-reports having 86 percent agreement with cotinine measurements (excluding smokers). These authors found that without the bogus pipeline, smokeless tobacco use was overreported. Bauman et al. (1989) studied 12- through 14-year-old adolescents in the southeastern United States. These investigators measured cotinine levels to indicate the use of some form of tobacco and distinguished cigarette smokers from smokeless tobacco users by values of thiocyanate and carbon monoxide. The authors found that fewer than half of the adolescents identified through chemical tests as smokeless tobacco users had reported such use in the past three days on a self-administered questionnaire in the home. Discrimination between smokers and smokeless tobacco users was also obtained by Noland et al. (1988) through measures of saliva cotinine and thiocyanate. As was noted in this report's discussion of the validity of smoking measures (see Appendix 2), the home setting may be conducive to underreporting. Ernster et al. (1990) studied a sample of 1,109 major and minor league baseball players and found that serum cotinine (< 12 ng/mL) and serum thiocyanate (< 85 mmol/L) correctly classified 95 percent of nonusers of smokeless tobacco and cigarettes. Other methods for validating smokeless tobacco use are being investigated, including the use of strontium in the buccal epithelium of smokeless tobacco users (Roberston and Bray 1988).

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Chapter 4
Psychosocial Risk Factors for Initiating Tobacco Use

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Introduction

Tobacco use begins primarily through the dynamic interplay of sociodemographic, environmental, behavioral, and personal factors. These psychosocial risk factors increase a person's chances both of beginning to use tobacco and of experiencing the immediate and long-term health problems associated with tobacco use. Young people (aged 10 through 18 years) are particularly affected by psychosocial factors and are thus particularly vulnerable to adopting tobacco use. Since psychosocial risk factors are the initial influences in the causal chain that leads to tobacco-related health consequences, primary prevention efforts to reduce smoking prevalence must take these influences into account.

Psychosocial risk factors for tobacco use can be viewed as a continuum of proximal to distal factors. Personal and behavioral factors that directly affect an individual's choice to use tobacco (when a cigarette is offered, for example) are considered proximal risk factors, whereas environmental and sociodemographic factors (such as billboard advertising and household income) that indirectly affect the accessibility or acceptability of tobacco use are classified as distal factors. Proximal factors are considered more immediate to a person's decision to use tobacco than distal factors. Still, as is shown in Chapter 5 (see "Research on the Effects of Cigarette Advertising and Promotional Activities on Young People"), distal factors acquire potency if they are pervasive and provide consistent, repetitive messages across multiple channels. Distal factors are also powerful because, over time, they affect proximal factors as these influences become interpreted and internalized, particularly among adolescents as they try to shape a mature self-identity.

This review examines each of these sets of risk factors to provide a comprehensive view of the antecedents of tobacco use, first for cigarette smoking, then for smokeless tobacco use. The database for this review includes research studies that have been published primarily in peer-refereed journals or books during the past 15 years. Results from these studies were grouped according to psychosocial risk factor, and conclusions were based on the availability and conclusiveness of the evidence for a given risk factor. Table 1 summarizes the major psychosocial risk factors examined in this chapter and in Chapter 5.

Table 1. Psychosocial risk factors in the initiation of tobacco use among adolescents

Risk factors	Smoking	Smokeless tobacco
Sociodemographic factors		
Low socioeconomic status	x	
Developmental stage	x	x
Male gender		x
Environmental factors		
Accessibility	x	x
Advertising	x	x
Parental use		
Sibling use	x	
Peer use	x	x
Normative expectations	x	x
Social support	x	
Behavioral factors		
Academic achievement	x	x
Other problem behaviors	x	x
Constructive behaviors	x	
Behavioral skills	x	
Intentions	x	x
Experimentation	x	x
Personal factors		
Knowledge of consequences		x
Functional meanings	x	x
Subjective expected utility	x	
Self-esteem/self-image	x	x
Self-efficacy	x	
Personality factors	x	
Psychological well-being	x	

Initiation of Cigarette Smoking

Introduction

Early public health efforts to prevent smoking among adolescents were largely informed by health-related and demographic findings from research stimulated by the landmark 1964 Surgeon General's report on smoking and health (Public Health Service 1964; Chassin, Presson, Sherman 1990). By the mid-1970s, the ineffectiveness of these attempts to reduce rates of smoking onset among adolescents further stimulated research into what motivates young people to begin smoking (Thompson 1978). Significant support for such research was provided by the National Clearinghouse for Smoking and Health, the National Institutes of Health, the National Institute on Drug Abuse (NIDA), and various private health organizations, including the American Lung Association, the American Cancer Society, and the American Heart Association.

The application of psychosocial theories to the area of adolescent smoking behavior provided a major breakthrough in the understanding of smoking initiation and development, pioneered by the conceptual and pilot work of Leventhal (1968), Bandura (1977), Evans et al. (1978), McAlister, Perry, and Maccoby (1979), and McGuire (1984). Rather than view cigarette smoking as a health behavior, these researchers examined smoking as a social behavior, with social causes, functions, and reinforcements. Although this early work involved mostly correlational research, such as examining the relationship between parental smoking and children's smoking behavior, research became increasingly theory-driven, longitudinal, prospective, and multivariate during the 1980s (Chassin, Presson, Sherman 1990). Conrad, Flay, and Hill (1992) recently reviewed 27 prospective studies on smoking initiation published since 1980 (see Table 2 for characteristics of these studies). The large number of such methodologically sophisticated studies provides a sufficient base of knowledge to begin drawing conclusions about the relative importance of a variety of risk factors for the onset of tobacco use.

The process of onset requires clarification. Regardless of the age at which they smoke their first cigarette, young people appear to progress through a sequence of stages that takes them from receptivity to dependence on tobacco use (Leventhal and Cleary 1980; Flay et al. 1983). Not all young people who try a cigarette become daily smokers; still, almost all of those who become daily smokers have experienced similar, well-defined stages in the behavior-acquisition process. The risk factors for each of these stages appear to differ; this variation suggests that even within the seven years of adolescence (ages 11 through 17), developmentally appropriate prevention programs should be used (Leventhal, Fleming, Glynn 1988).

Developmental Stages of Smoking

Flay (1993) discusses the five primary stages of smoking initiation among children and adolescents (Figure 1). During the first or preparatory stage, attitudes and beliefs about the utility of smoking are formed. At this stage, even if no actual smoking behavior is enacted, the child or adolescent may see smoking as functional—as a way to appear mature, cope with stress, bond with a new peer group, or display independence (Perry, Murray, Klepp 1987). The second or trying stage encompasses the first two or three times an adolescent smokes. Peers are usually involved in situations that encourage trying (Conrad, Flay, Hill 1992). Whether the physiological effects of smoking are perceived to be negative and whether these tries are socially reinforced determine if an adolescent will proceed to the next stage (Leventhal, Fleming, Ershler, unpublished data), experimentation, which includes repeated but irregular smoking. At this third stage, smoking is generally a response to a particular situation (such as a party) or to a particular person (such as a best friend). These influences will not yet have prompted a regular pattern of use. In the fourth stage, regular use, an adolescent smokes on a regular basis, usually at least weekly, and increasingly across a variety of situations and personal interactions. The final stage, nicotine dependence and addiction (see "Nicotine Addiction in Adolescence" in Chapter 2), is characterized by a physiological need for nicotine. This need includes tolerance for nicotine, withdrawal symptoms if the person tries to quit, and a high probability of relapse if the person does quit (Flay 1993). These stages have been further quantified and validated by Stern et al. (1987).

The time interval from the initial try to the stage of regular use takes an average of two to three years, with considerable interval variation among individuals (Leventhal, Fleming, Glynn 1988). McNeill (1991) found in a prospective study that of those who experimented with cigarettes, approximately half were smoking on a daily basis within one year. Leventhal, Fleming, and Glynn (1988) suggest that the time interval from the initial try to the stage of regular use may be extended, particularly if the time is lengthened between the first and second try. This observation suggests that to delay both the onset of first trials as well as the progression to regular use, it seems critical to examine risk factors for first use. Since a young person may become a regular smoker in only two to three years, the adolescent period of development (particularly middle school, junior high school, and senior high school) is a crucial time for prevention efforts (Evans et al. 1978).

Sociodemographic Factors in the Initiation of Smoking

Sociodemographic factors involve the economic, political, social, and educational systems of a society. These factors can be determinants of behavior, such as tobacco use, even if the systems they originate in are not directly associated with the choice to begin that behavior. Within these systems, social disorganization or

Table 2. Characteristics of 27 prospective studies of smoking onset, various countries, 1980–1991

Study	Year of publication	Place	Age[*] (years)	Time[†] (months)	Number[‡] (nonsmokers)
Ahlgren et al.	1982	Minnesota	10–11, 11–12	6	562
Alexander et al.	1983	NSW Australia[§]	10,11,12	12	5,065
Ary et al.	1989	Oregon	12–13,14–15,15–16	6	801
Ary and Biglan	1988	Oregon	12–15,15–16	12	737
Bauman et al.	1984	North Carolina	14–15	12	519
Brunswick and Messeri	1984	New York City	12–16	84	380
Charlton and Blair	1989	Manchester, UK	12–13	4	1,513
Chassin et al.	1984	Indiana	11–16	12	1,207
Chassin et al.	1986	Indiana	11–16	12	145
Collins et al.	1987	Los Angeles	12–13	16	1,354
de Vries et al.	1990	Netherlands	Secondary	12	555
Goddard	1990	England	11–15	24	2,251
Kellam, Ensminger, Simon	1980	Chicago	6–7	120	705
Krohn et al.	1983	Iowa	12–18	12	NA[‖]
Lawrance and Rubinson	1986	Illinois	12–14	8	346
McCaul et al.	1982	Minnesota	12–13	12	268
McNeill et al.	1988	Bristol, UK	11–13	30	1,261
Mittelmark et al.	1987	Minnesota	12–14,14–16	18	887
Murray et al.	1983	Derbyshire, UK	11–12	48	2,217
Newcomb, McCarthy, Bentler	1989	Los Angeles	12–13,13–14,14–15	96	NA
Pulkkinen	1982	Finland	8–9	144	135
Semmer, Cleary, et al.	1987	Berlin–Bremen	12–13	24	761
Semmer, Lippert, et al.	1987	Berlin–Bremen	12–14	6	763
Skinner et al.	1985	Iowa	12–18	24	426
Stacy et al.	unpublished	Los Angeles	12–13	16	1,116
Sussman et al.	1987	Los Angeles	12–13	16	338
Urberg, Cheng, Shyu	1991	Detroit suburb	13–14,16–17	12	NA

Source: Adapted from Conrad, Flay, Hill (1992).

[*] Age = Age (in years) of students at the beginning of the study.

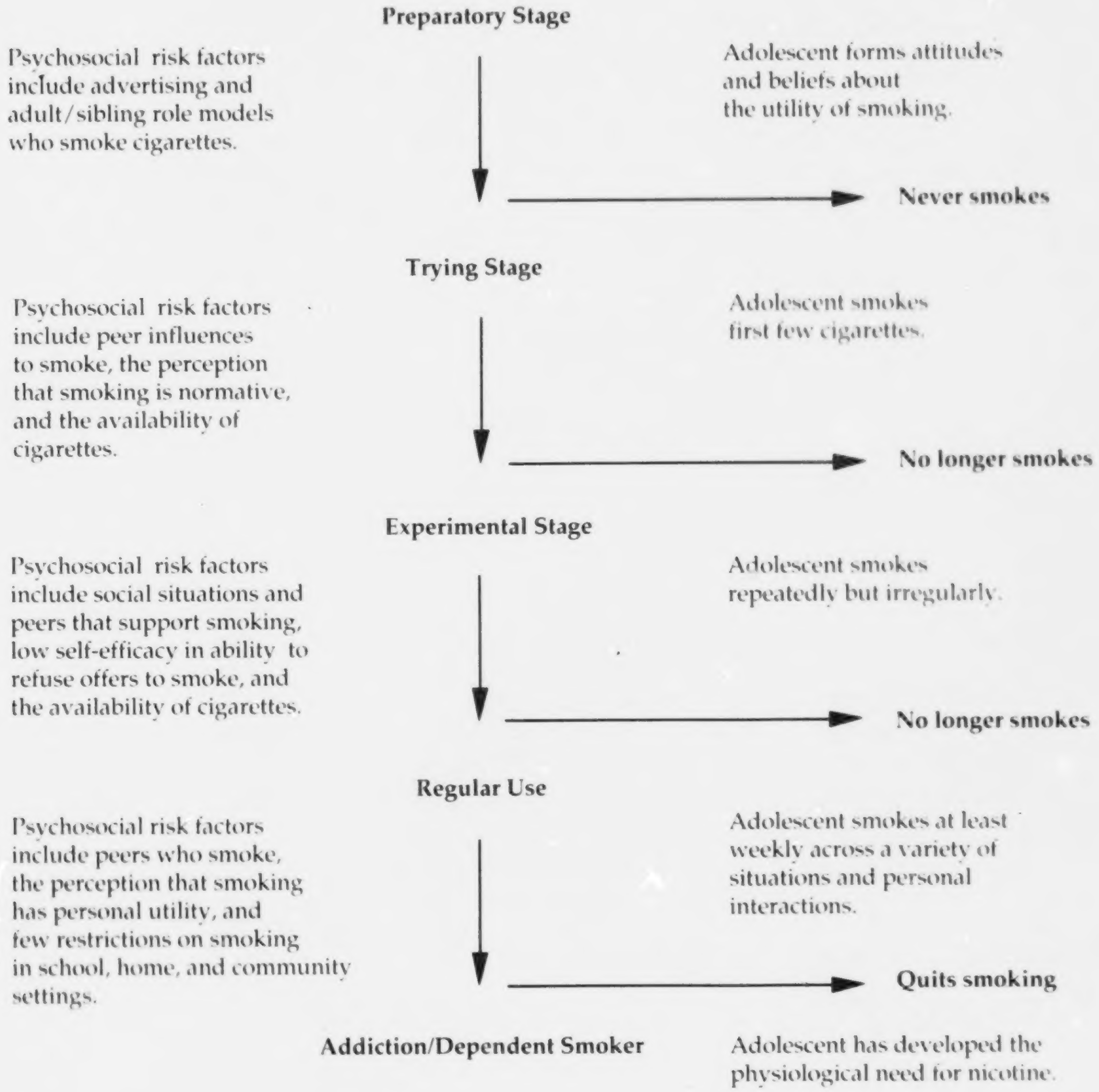
[†] Time = Number of months from the beginning of the study to the final follow-up wave.

[‡] Number = Number of nonsmoking students at the beginning of the study.

[§] NSW Australia = New South Wales, Australia.

[‖] NA = Not available.

Figure 1. Stages of smoking initiation among children and adolescents



Preparatory Stage

Psychosocial risk factors include advertising and adult/sibling role models who smoke cigarettes.

Adolescent forms attitudes and beliefs about the utility of smoking.

Never smokes

Trying Stage

Psychosocial risk factors include peer influences to smoke, the perception that smoking is normative, and the availability of cigarettes.

Adolescent smokes first few cigarettes.

No longer smokes

Experimental Stage

Psychosocial risk factors include social situations and peers that support smoking, low self-efficacy in ability to refuse offers to smoke, and the availability of cigarettes.

Adolescent smokes repeatedly but irregularly.

No longer smokes

Regular Use

Psychosocial risk factors include peers who smoke, the perception that smoking has personal utility, and few restrictions on smoking in school, home, and community settings.

Adolescent smokes at least weekly across a variety of situations and personal interactions.

Quits smoking

Addiction/Dependent Smoker

Adolescent has developed the physiological need for nicotine.

Sources: Adapted from Flay (1993); U.S. Department of Health and Human Services (1991).

breakdown and discrepancies between role aspirations and achievements may lead to incomplete or inappropriate social development of adolescents. Inappropriate social development, in turn, can alter personal and behavioral factors, such as normative expectations of smoking, that affect the choice to use tobacco (Flay 1993). Tobacco use may vary according to broad factors such as an individual's socioeconomic status, family structure, age, gender, and ethnicity, especially when examined across an entire population. Many of these factors are covered in Chapter 3 (see "Recent Patterns of Cigarette Smoking").

Socioeconomic Status

Low socioeconomic status (SES) has been shown to predict smoking initiation in multiple longitudinal studies (Conrad, Flay, Hill 1992). Semmer, Lippert, et al. (1987) examined tobacco use among students in two schools in Germany. These investigators found that seventh- and eighth-grade students from the school in a low-income area (children of primarily blue-collar parents) had higher baseline rates of tobacco use than youth from the school in a higher-income area. Low-income students were also more likely to begin smoking over the course of this six-month study. Low-income students had greater expectations of positive consequences of smoking, lower self-image scores, and more friends who smoked. One possible explanation of the impact of SES supported by these findings is that lower-income students may have to cope more often with stressful situations, such as lacking sufficient resources or living in a one-parent family, and are therefore more likely to perceive smoking as a quick, easy coping strategy for stress or loneliness—and as a strategy that is socially accepted and effective (Semmer, Cleary, et al. 1987). Adolescents from low-income families may also have more role models who smoke and less supervision to discourage experimentation than adolescents from higher-income families (Perry, Kelder, Komro 1993).

Parental Education

The level of parental education has been shown to have a significant impact on adolescent smoking behavior in some studies. Although Ary et al. (1983) failed to find a relationship between parental education and children's smoking behavior, in a later report, Ary and Biglan (1988) found that low educational attainment among fathers was predictive of smoking onset in middle school youth. Waldron and Lye (1990) reported that high school seniors who had less-educated parents were more likely to have tried a cigarette and to have adopted cigarette smoking and were less likely to have quit smoking. Finally, Mittelmark et al. (1987) found that both adolescent females at all grade levels and adolescent males in grades 9 through 11 who began to smoke during the course of the study had parents with fewer years of formal education than their peers who remained nonsmokers. However, for seventh- and eighth-grade males in this study, parental educational level did not help to predict smoking initiation. See "Trends in Cigarette Smoking" in Chapter 3 for a trend analysis of adolescent smoking behavior and level of parental education.

Number of Parents Living in the Home

Several studies document an association between beginning to smoke during childhood or adolescence and living in a single-parent home (Oei, Egan, Silva 1986; Elder, Molgaard, Gresham 1988; Isohanni, Moilanen, Rantakallio 1991; Goddard 1990; see "Sociodemographic Risk Factors for Smoking" in Chapter 3). These findings must be interpreted with caution, since most are from cross-sectional studies that were unable to determine with certainty which occurred first—living in a single-parent home or smoking. If a predictive relationship does exist, a mechanism described by Castro et al. (1987) may help to explain the causal link. Their analyses found that living in a disrupted family system is an initial stressor that appears to predict social nonconformity and affiliation with cigarette-smoking peers. In turn, as will be discussed later in this chapter, both social nonconformity and peer affiliation are significant predictors of cigarette smoking among adolescents.

Developmental Challenges of Adolescence

The life stage of adolescence itself has been a consistent predictor of smoking initiation across studies (Alexander et al. 1983; Coombs, Fawzy, Gerber 1986; Bauman et al. 1990). The transition years from elementary to secondary school seem to be a particularly high-risk time for adolescent initiation of tobacco use (Alexander et al. 1983; Coombs, Fawzy, Gerber 1986). Indeed, both the rate of onset of smoking and the prevalence of regular smoking may level off during the high school years (Kandel and Logan 1984; McDermott et al. 1992). The relationship between adolescence and smoking initiation that is seen in these studies may be related to the developmental challenges of adolescence and to the social meaning of smoking.

Adolescence is characterized by three major types of developmental challenges (Hooker 1991). The first involves physical maturation, particularly sexual maturation, and the establishment of intimate relationships. A second group of challenges involves responses to cultural pressures to begin making the transition to adult roles and responsibilities and to emotional independence from parents. The third area, the personal, involves establishing a coherent sense of self and a set of values to guide future behavior. As adolescence begins, efforts to meet these various challenges are characterized by experimentation and risk-taking behaviors (Konopka 1991). Cigarette smoking is a risk behavior portrayed by advertising and role models as a way to be attractive to one's peers (see "Contemporary Strategies of the Tobacco Industry" in Chapter 5), and smoking appears to contribute to a positive social image in some settings (Sussman et al. 1987). The functions of smoking established by advertising and adult role models coincide with the challenges of adolescence and thus make this age group the most vulnerable for experimentation and initiation.

Gender

Although current smoking prevalence is roughly equal among males and females in the United States, different historical trends for men and women are evident (Grunberg, Winders, Wewers 1991). Between 1974 and 1985, smoking initiation declined from 45 to 33 percent among young men but remained constant at 34 percent among young women (Fiore et al. 1989; see "Trends in Cigarette Smoking" in Chapter 3). Two studies have discussed the impact of changing gender roles (e.g., more women are in traditionally male positions of authority) on smoking behavior and the resulting difference in meaning that smoking has for males and females (Gritz 1984; Gilchrist, Schinke, Nurius 1989). Though some have suggested that generic factors that influence smoking initiation, such as appealing to the opposite gender, become more pronounced for one gender or the other at certain ages (Chassin et al. 1986), others have further concluded that the complex combinations of risk factors and processes leading to smoking are fundamentally different for females and males (Brunswick and Messeri 1984). In a review of research on gender differences, Clayton (1991) found both considerable similarities (for instance, the influence of peer and parent models) and a number of possible differences between adolescent females and males who smoke. For example, adolescent girls who smoke are more socially skilled (e.g., more at ease with their peers, with strangers, or with adults) than their nonsmoking peers, whereas adolescent boys who smoke tend to lack such skills. Concern about body weight and the belief that smoking might help control body weight may also lead adolescent females to begin smoking (Gritz and Crane 1991; Camp, Klesges, Relyea 1993). Further longitudinal research is needed to investigate gender differences in the determinants of tobacco use and thus to clarify the effect of gender on smoking initiation.

Ethnicity

Research also indicates that the rate of smoking initiation varies among ethnic groups. Sussman et al. (1987) found that among California youth progressing from seventh to eighth grade, onset rates were higher for Hispanics and blacks than for whites and were lowest for Asians. Similarly, Maddahian, Newcomb, and Bentler (1986) found that among California students followed from 7th through 12th grades, black youth maintained higher rates of smoking than youth of other ethnic groups. White and Hispanic students had intermediate rates of smoking, and Asian youth reported the lowest levels, although this difference decreased over time. Other national reports, however, indicate a higher percentage of smoking among white adolescents and young white adults than among their black or Hispanic counterparts (Remington et al. 1985; Fiore et al. 1989; Bachman et al. 1991; see "Trends in Cigarette Smoking" in Chapter 3). These findings suggest different onset and quitting patterns among ethnic groups, as well as potential regional differences in these patterns.

Maddahian, Newcomb, and Bentler (1986) have proposed antecedents that may help explain these ethnic differences in tobacco use, including income levels that preclude or enable the acquisition of cigarettes, different levels of tobacco availability, and psychosocial influences associated with belonging to a particular ethnic group. These investigators found that among California students, the level of income earned by youth had a significant impact on explaining ethnic differences in tobacco use. However, ethnic differences were virtually eliminated when availability and ease of cigarette acquisition from friends were considered.

Sussman et al. (1987) found that unique combinations of psychosocial factors may be relevant to the ethnic differences in smoking initiation. Three variables—availability of cigarettes, difficulty in refusing offers of cigarettes, and intentions to smoke in the future—were significant predictors among youth from all ethnic groups included in their study. However, only among select groups were certain other variables important predictors of smoking initiation. For instance, social environmental variables (including peer smoking and adult smoking) were important predictors for white youth, but direct personal and social reinforcement variables (including improved self-image and adult and peer approval of smoking) were more important variables for Hispanic youth. General risk-taking behavior was an important additional predictor for black youth only. The strongest additional predictors for Asian students included lack of general self-esteem and decreased school-related self-esteem.

Environmental Factors in the Initiation of Smoking

Environmental factors are those that are external (or perceived as external) to adolescents and yet may influence and affect their behavior. These factors include the availability of cigarettes in the community, the acceptability of smoking, peer and parental smoking, and adolescents' perceptions of the environment.

Factors That Influence Tobacco Acceptability and Availability

Factors that increase the acceptability and availability of cigarette use at a societal or community level serve also to influence adolescent smoking behavior. Acceptability and availability are affected, in part, by the tobacco industry through advertising and other promotional activities; this topic is discussed thoroughly in Chapter 5. Acceptability of tobacco use may also be accomplished through persuasive, multiple, attractive role models who smoke on television programs or in movies (Bandura 1977). Acceptability is further reinforced by community norms and policies that make tobacco products relatively accessible for adolescents—for example, through sales to underage buyers and unrestricted access to cigarette vending machines (see "Restrictions on Minors' Access to Tobacco" in Chapter 6). The National Adolescent Student Health Survey (American School Health Association et al. 1989) found that 79 percent of 8th graders and 92 percent of 10th graders considered it to be "very easy" or "fairly easy" to get cigarettes. Likewise, in the 1991 Monitoring the Future Project study (Johnston, O'Malley, Bachman 1992) 73 percent of 8th graders and 88 percent of 10th graders reported that it would be "fairly easy" or "very easy" to get cigarettes. In a study of adolescents in southern California, Sussman et al. (1987) found that both genders and all racial/ethnic groups except Asians tended to believe that they could obtain cigarettes with little difficulty. Findings from a national sample of teenaged (12–17 years old) smokers confirm these perceptions and suggest that 1.5 million of an estimated 2.6 million underage smokers buy their own cigarettes (Centers for Disease Control [CDC] 1992). Of those who buy their own cigarettes, 84 percent purchase them from a small store, 50 percent from a large store, and 14 percent from a vending machine, either often or sometimes (CDC 1992). These reports have been substantiated by observational studies of cigarette buying by young teenagers (see "Studies of Young People's Access to Tobacco" in Chapter 6). Several studies have found that the general availability of cigarettes predicts the onset of smoking (Bauman et al. 1984; Semmer, Cleary, et al. 1987).

Factors that increase acceptability and availability support a social milieu in which cigarette smoking may appear socially functional. On the other hand, a social milieu can decrease the risk of adolescent smoking—if, for example, communities choose to restrict exposure to tobacco-promoting images or restrict access to tobacco products (see Chapter 6 for further discussion of such restrictions). Currently, as more communities and states adopt a variety of restrictive policies and programs, evaluation research is needed to examine the effectiveness of these strategies for reducing onset of tobacco use.

Interpersonal Factors

Interpersonal factors in the initiation of smoking involve opportunities for adolescents to perceive, through modeling by adults and peers who smoke, apparent advantages of smoking. These role models (particularly peers) also provide the situations (e.g., parties, staying overnight) in which cigarettes are first tried by adolescents (Lawrance and Rubinson 1986). Interpersonal factors have also been labeled "social learning variables" (Bandura 1977; Flay 1993) because the social functions or meanings of smoking are learned in the context of social interactions. The research on interpersonal factors has carefully explored the roles of parents, siblings, friends, and peers in the process of initiation.

Parental Smoking

The research on the influence of parents' smoking behavior on their children's cigarette use has included multiple studies of the relative risk of initiation if one or both parents smoke. Bauman et al. (1990) found a consistent relationship between parental and adolescent smoking in a cross-sectional study of 12- through 14-year-olds in 10 urban areas in the southeastern United States. Compared with adolescents whose parents had never smoked, those whose parents currently smoked were almost twice as likely to smoke; those whose parents had once smoked were three times as likely to smoke. A similar influence of parental smoking was noted by Chassin et al. (1986) for females in a longitudinal study of 12- through 18-year-olds from the midwestern United States. In Sussman et al. (1987), a longitudinal study of 11- through 14-year-olds in southern California, parental smoking was predictive of a child's smoking for whites but not for Hispanics, blacks, or Asians. This finding matches that of Hunter et al. (1987) in a longitudinal study of 8- through 17-year-olds in the southern United States, in which parental behavior was predictive of children's smoking initiation for whites but not for blacks.

By contrast, parental smoking behavior was a poor predictor of smoking initiation in several other studies, including the longitudinal study McCaul et al. (1982) conducted among 11- through 14-year-old whites living in the north-central United States. No relationship was found in the Botvin et al. (1992) cross-sectional study of

608 inner-city blacks aged 11 through 13 or in the longitudinal study of 2,209 primarily white 11- through 17-year-olds in Minnesota (Mittelmark et al. 1987). In Quine and Stephenson's (1990) cross-sectional study of over 2,000 Australians aged 10 through 12, parental smoking was not associated with children's smoking but was related to children's intentions to smoke when older.

Conrad, Flay, and Hill (1992) summarized the findings of 27 prospective studies on the onset of smoking that have been published since 1980 (see Table 3). In 15 of the studies, parental smoking factors were investigated. The researchers concluded that parental smoking was predictive in seven studies, predictive only for females in two studies, and not predictive in six others. Chassin et al. (1984) suggested that parental smoking may influence the preparatory or initial trying stages, as well as the stability of smoking patterns from adolescence to adulthood (Chassin et al. 1991), but parental smoking appeared to be less influential during the transition to regular smoking.

Sibling Smoking

Over the past two decades, extensive research on the influence of sibling smoking indicates a primarily positive relationship between an older sibling's smoking and a younger (adolescent) sibling's beginning to smoke. In a 10-year longitudinal study of 6,311 adolescents (initially 11 through 13 years old), sibling smoking was found to be one of four factors that was predictive of increased risk of initiating regular smoking and predictive of smoking prevalence after 10 years (Swan, Creeser, Murray 1990). In the McNeill et al. (1988) longitudinal research with 2,159 British 11- through 13-year-olds, having a sibling who smoked appeared to increase the odds of smoking initiation by a factor of 1.69. Botvin et al. (1992) reported that sibling smoking was one of five variables that accounted for 29 percent of the variance in smoking in their cross-sectional study of 522 inner-city blacks aged 11 through 13. O'Connell et al. (1981) found sibling smoking to be among the first three factors associated with weekly

Table 3. Predictors of smoking onset in 27 prospective studies

Prediction of smoking onset	Number of supportive findings	Number of unsupportive findings	Percent support
Socioeconomic status	16	5	76
Environmental factors			
Family smoking	18	8	69
Family approval	6	8	43
Other adult influences	5	3	63
Peer use and approval	27	5	84
Normative estimates	4	1	80
Offers/availability	7	1	88
Family bonding	9	6	60
Peer bonding	11	4	73
School influences	20	5	80
Religious influences	0	1	0
Behavioral factors			
Skills	3	0	100
Other behaviors	12	2	86
Personal factors			
Knowledge/beliefs	16	9	64
Attitudes	8	3	73
Personality factors	23	7	77
Intentions to smoke	8	1	89

Source: Adapted from Conrad, Flay, and Hill (1992).

smoking among 6,224 students aged 10 through 12 in New South Wales, Australia. Mittelmark et al. (1987) found that experimenting with cigarettes was associated with sibling smoking only for females and 11- through 13-year-old students. This finding was similar to the Chassin et al. (1984) research that found sibling smoking more influential in the early stages of cigarette use than in the later stages.

Gender and race differences in the effect of sibling smoking have also been noted. Hunter et al. (1987) found sibling smoking predictive for white males, a sister's smoking predictive for white females, and a brother's smoking predictive for black males and females. Brunswick and Messeri (1983) found sibling smoking influential only for males. In the Muscatine Study (Krohn, Naughton, Lauer 1987), the maintenance (not initiation) of smoking was associated with a brother's smoking. Finally, in Conrad, Flay, and Hill's (1992) review of 27 prospective studies, four of the five studies that examined this factor indicated that sibling smoking was associated with onset.

Peer Smoking and Peer Behaviors

One of the areas of widest investigation in the antecedents of cigarette smoking concerns peer smoking and related peer behaviors. Peers may be defined as persons of about the same age who feel a social identification with one another. The influence of peers has been posited as the single most important factor in determining when and how cigarettes are first tried. Flay et al. (1983) suggest that smoking may primarily represent an effort to achieve social acceptance from peers and that it may particularly be an experimental "adult" activity that is shared with the peer group. Leventhal and Keeshan (1993) suggest that adolescents are not only influenced by, but also influence and construct, their peer groups. These researchers propose that small groups of adolescents "construct shared social environments in which they perceive themselves and other(s) as having mutual cognitive, emotional, and valuative reactions. . . . the intersubjectivity created by sharing generates a sense of wellness. This sense of mutuality enhances the attractiveness of the group and may lead to incorporation of the self-image of the others into the image of one's own self" (p. 269).

Multiple cross-sectional and longitudinal studies worldwide substantiate the relationship between smoking onset and peers' (or friends') smoking (Shean 1991; O'Connell et al. 1981; Ogawa et al. 1988). In their research, Bauman et al. (1990) found that smoking most often occurred in the presence of best friends. Sixty percent of 11- through 17-year-olds reported that they had first smoked, and 72 percent reported that they had most recently smoked, with close friends (Hahn et al. 1990). Among 12- through 14-year-olds, those whose best friend smoked were four times more likely to be smokers than those whose best friend did not smoke. Best friend's smoking predicted both smoking experimentation and prevalence among urban San Diego adolescents from a variety of ethnic groups (Elder, Molgaard, Gresham 1988) and among white and black 8- through 17-year-olds in Louisiana (Hunter, Vizelberg, Berenson 1991). Best friend's cigarette use was predictive of the first try at smoking, whereas having a majority of friends who smoke was predictive of the second cigarette (Leventhal, Fleming, Glynn 1988).

In the Conrad, Flay, and Hill (1992) review of the recent prospective research, friends' smoking was predictive of some phase of smoking in all but one (Newcomb, McCarthy, Bentler 1989) of 16 studies. A positive association of peer smoking with onset of smoking in 88 percent of these more rigorous, longitudinal studies suggests a clear link between peers' smoking and cigarette use. This link may be mediated by personal factors, such as self-efficacy (or self-confidence), and appears to be most potent in the earlier stages of smoking (Pomerleau 1979; Pederson and Lefcoe 1986; Chassin, Presson, Sherman 1990).

Social Bonding

The interpersonal environment has also been characterized by the degree of social bonding, or attachment, between the adolescent and important others or institutions.

The findings on family bonding variables in smoking onset, particularly attachment to mothers or fathers, have been inconsistent; those related to peer bonding, including the number of friends, level of social life, participation in antisocial activities, and having a boyfriend or girlfriend, were all found to be predictive of onset (Conrad, Flay, Hill 1992). Bonding with peers who smoke appears to increase the risk of smoking, perhaps because such bonding takes precedence over attachments to the family.

Perceived Environmental Factors

The perceived environment includes the smoking-related norms, social support, expectations, reactions, and barriers that adolescents sense in their environment. The perceived environment may be a more proximal influence on smoking initiation than the actual environment (Jessor and Jessor 1977). For example, 12-year-olds who believe that "lots of people" their age smoke may be more inclined to begin smoking to fit in than if they were aware that only 5 to 7 percent of their peers actually smoke.

Norms

Norms may be defined as what an individual in a particular group perceives she or he ought to do and what is perceived as acceptable behavior for a given age group, gender, or other subgroup. Gerber and Newman's (1989) research on smoking-related norms details adolescents' perceptions of the percentage of all adults, peers, and classmates they think are smokers. These investigators found that experimental adolescent smokers who increased their smoking levels over the course of the one-year study period perceived more smoking among their classmates than did those who had decreased their smoking in the same time period. Similarly, Leventhal, Fleming, and Glynn (1988) report that youth who participated in their studies greatly overestimated the proportion of peers and adults who smoke. The adolescents believed that 66 percent of their peers and 90 percent of adults were smokers, thus overestimating smoking prevalence by at least a factor of three.

Collins et al. (1987) examined the predictive influence of norms in a longitudinal study of 3,295 students aged 11 and 12 in 56 junior high schools in Los Angeles. Like Chassin et al. (Chassin et al. 1984; Chassin, Presson, Sherman 1990), they found that adolescents who made relatively high estimates of regular smoking prevalence were more likely to try smoking, to become smokers, or to increase the amount they smoked over 1 and 1.5 years of the study. Sussman et al. (1993) discussed further aspects of normative influence and implications for the content of prevention programs. Previous smoking and peer smoking were the main predictors of overestimates in the Collins et al. (1987) study. In Shean's (1991) research in Australia, beliefs about the number of adolescents and adults who smoke predicted smoking in young adulthood eight years later. In part, these normative expectations may be a function of these beginning smokers' actual exposure to a disproportionate number of smokers, including adults and peers.

Social Support for Smoking

Social support includes perceived approval or disapproval of adolescent cigarette smoking by parents, siblings, peers, and important others, such as teachers or employers. One way that social support is manifested is through peer-group pressure, either through support or discouragement of smoking.

Peer pressure is not always negative; it has been used successfully in many prevention programs (Klepp, Halper, Perry 1986). Still, in the study by Hahn et al. (1990), the urging of one or more acquaintances—most likely peers or close friends—prompted over half the instances of adolescents' trying a cigarette for the first time. In the Chassin et al. (1986) study, females who saw their friends as more supportive than critical about their smoking were more likely than those who saw their friends as less supportive to become regular smokers one year later. Similarly, many adolescent smokers in another study reported, "My friends like me because I smoke" (Hunter et al. 1987). In the same study, smokers were less likely than nonsmokers to report, "My parents don't want me to smoke." Peer approval of smoking was an important predictor for smoking onset among whites and Hispanics, whereas adult approval was an important predictor for Hispanics and Asians among 874 southern California 11- through 13-year-olds (Sussman et al. 1987).

Social support also includes the general support or approval the adolescent receives from others. This kind of support appears to play a role in predicting onset (see "Trends in Knowledge and Attitudes About Smoking" in Chapter 3). Chassin et al. (1986) found that those adolescents who reported that their parents were generally supportive of them were less likely to begin smoking or to become regular smokers than were those who perceived that their parents were not generally supportive of them. However, those who reported that their friends were supportive of them were more likely to become smokers than were those who did not report such support. Similarly, males who reported that they lived in families in which they had limited involvement in family decisions were more likely to become smokers than males from families where high involvement in family decisions was reported (Mittelmark et al. 1987). Adolescents who reported regularly caring for themselves after school were at increased risk of smoking (Richardson et al. 1989). Finally, adolescents who believed that parents, siblings, friends, and teachers would not care if they smoked were at higher risk of initiating smoking after 2.5 years than were those who believed that others would care if they smoked (McNeill et al. 1988). Lack of concern by parents appears to increase risk, particularly for males (Swan, Creeser, Murray 1990). General parental support of the adolescent and concern about the adolescent's smoking appears to decrease risk.

Parental Reaction to Smoking

Parental reaction to use and perceived parental strictness have also been associated with onset. Hansen et al. (1987) examined the influence of perceived parental reactions to cigarette smoking (as well as alcohol and marijuana use) among 293 Los Angeles 10- through 12-year-olds. Parental anger toward the adolescent's smoking or approval of the adolescent's refusing to smoke, together with two other drug-related variables, indirectly predicted low levels of use. Chassin et al. (1986) evaluated perceptions of parental strictness; their findings support the need for interventions tailored to different age groups of adolescents. Among the youngest subjects (10 through 12 years old), those who perceived that their parents were more strict than other parents were actually more likely to begin smoking over a one-year interval. Among the oldest subjects (14 through 16 years old), however, those who perceived that they had stricter parents were less likely to begin to smoke. Those aged 12 through 14 years were not affected by parental strictness. Other researchers have further noted that extremes of parental strictness, from inadequate restraint to overcontrol, are associated with problem behaviors (Pandina and Schuele 1983).

Adult Discrepancy

Shean (1991) developed the concept of adult discrepancy—the discrepancy between the "adult" behaviors in which an adolescent wants to participate at age 14 (such as going to a nightclub) and what was actually done by his or her parents when they were age 14. Those adolescents with high discrepancy were more likely to be smokers as young adults than those with low discrepancy, which may suggest that adolescents with high discrepancy tend to make the transition to an adulthood not modeled by parents. The adult discrepancy factor, in addition to peer, sibling, and parental smoking, intentions to smoke, and effects of cigarette advertisements, predicted young adult smoking over an eight-year interval. This study points to the strong effect of the social environment on the onset and maintenance of adolescent smoking.

Behavioral Factors in the Initiation of Smoking

Behavioral factors involve patterns of behaviors that are directly related to cigarette use, such as academic achievement, health-compromising and health-enhancing behaviors, and smoking-related skills. These associated behavior patterns may increase the risk of smoking by providing opportunities to view smoking as functional or appropriate.

Academic Achievement

The onset of smoking has been shown repeatedly to be related to poor academic achievement (see Table 6 in Chapter 3). Relevant indicators of students' achievement include scholastic performance (grades), high school graduation, truancy rates, and future professional or educational aspirations. Borland and Rudolph (1975) examined the relative predictability of scholastic performance, parental smoking, and socioeconomic status among 1,814 high school students in Pennsylvania. The strongest correlate to smoking was scholastic performance; those with the highest grades were found to smoke less than those with the lowest grades. This finding is consistent with Brunswick and Messeri's (1984) research among young, urban black adolescents in Harlem, New York, as well as the Sussman et al. (1987) research with Hispanic and Asian adolescents in southern California. Students who disliked school and feared school failure were more likely to begin smoking in early adolescence than those who liked school and had expectations of school success (Ahlgren et al. 1982). In two well-designed studies, adolescents who had limited expectations of academic achievement increased their smoking levels over time (Gerber and Newman 1989; Chassin, Presson, Sherman 1990). Still, among inner-city black seventh-grade students, Botvin et al. (1992) found that academic achievement was not a significant predictor of current smoking or intentions to smoke.

Conrad, Flay, and Hill (1992) found that 80 percent of the prospective studies on the onset of smoking indicated a positive relationship between low academic achievement (and other school-related factors) and smoking onset. In a longitudinal study of 739 junior high students (66 percent white, 15 percent black, 10 percent Hispanic) in Los Angeles, the research team of Newcomb, McCarthy, and Bentler (1989) concluded that an adolescent's "academic lifestyle orientation" (measured by grades, educational aspirations, personal and profession plans, and expectations) was the central organizing influence on teenage smoking behavior, teenage emotional well-being, social relationships with smokers, and adult smoking behavior. This centrality emerged even when emotional well-being, self-efficacy, personal ambition, and friends' smoking behavior were considered.

Other Adolescent Behaviors

The association between smoking and other adolescent behaviors has been examined as an extension of Jessor and Jessor's (1977) concept of the covariation of problem behaviors, including both unconventional behaviors (such as alcohol and drug use) and conventional behaviors (such as academic achievement and church attendance). Cigarette use among adolescents has been studied as "problem" behavior; that is, studies have examined its association with alcohol and drug use, risk-taking behaviors, proneness to deviance, early antisocial behavior, and group membership, as well as its association with constructive or health-enhancing behaviors. Some adolescents see problem behaviors as a way to achieve—and signal to others—the precocious transition to independence and autonomy.

The association of cigarette smoking and illegal drug use suggests that cigarettes may be an entry-level or gateway drug in a sequence of progressive drug use (see "Smoking as a Risk Factor for Other Drug Use" in Chapter 2 and "Smoking and Other Drug Use" in Chapter 3). The suggestion here is not that smoking causes illegal drug use, but that those who use illegal drugs have most likely smoked cigarettes previously. In the following studies, smoking is considered a gateway drug, since the decision to smoke appears to facilitate the decision to use other drugs.

Scheier and Newcomb (1991) studied 717 junior high school students in northern California. They concluded that early cigarette use predicted illegal drug use during the two-year study period. This finding complements the work of Fleming et al. (1989) and Newcomb and Bentler (1986), who emphasized the crucial role of cigarette smoking in the progression to marijuana and hard drug use, even without the mediating impact of alcohol use. Those authors concluded that these substances are reciprocally influential over time, with increased use of cigarettes associated with increased use of illegal drugs. By young adulthood, a clear correlation seems to exist between cigarette smoking and illegal drug use. For example, in Brunswick and Messeri's (1983) 6- to 8-year prospective study of 536 blacks aged 11 through 13 in Harlem, New York, at follow-up (aged 18 through 23), 56 percent of males and 59 percent of females who had used illegal drugs smoked cigarettes, whereas 24 percent of males and 35 percent of females who had not used illegal drugs smoked cigarettes.

Risk Taking, Rebelliousness, and Deviant Behaviors

Risk taking, rebelliousness, and deviant behaviors are generally those behaviors that are considered unconventional, antisocial, or alienated from traditional institutions. The research literature has repeatedly characterized adolescent drug use as one manifestation of rebelliousness and deviance (Jessor and Jessor 1977; Chassin, Presson, Sherman 1989). By testing Jessor and Jessor's (1977) model, Chassin et al. (1984) found that proneness to deviance significantly predicted smoking onset in a longitudinal study of secondary students, although not for those who had already experimented with cigarettes. In a subsequent study of high school students, Chassin, Presson, and Sherman (1989) found that in some instances, deviance was associated with independence and personal control; whether psychologically constructive or not, however, deviance was a significant predictor of cigarette smoking. A risk-taking orientation (that is, an inclination toward excitement and chance taking) was similarly associated with trying a cigarette for the first or second time (Leventhal, Fleming, Glynn 1988). Risk taking was also a significant predictor of smoking initiation in the Collins et al. (1987) study of 11- and 12-year-olds in Los Angeles. In the Sussman et al. (1987) study of southern California adolescents, risk taking predicted smoking among blacks, but the association was not significant for whites, Hispanics, or Asians. Conrad, Flay, and Hill's (1992) review of prospective research on smoking initiation cited five studies that associated rebelliousness, risk taking, and proneness to deviance with smoking onset (see "Cigarette Smoking and Other Health-Related Behaviors" in Chapter 3).

Peer Groups

During the past two decades, the relative importance of adolescent bonding with peers has increased, while the importance of bonding with parents has declined (Perry, Kelder, Komro 1993). This shift has allowed more time, opportunity, and social support for dysfunctional behaviors, such as cigarette use. Adolescent females who spent most of their free time with their families, for example, were less likely to begin smoking than those who spent little free time with their families (Brunswick and Messeri 1984). As Flay (1993) notes, "youth alienated from conventional culture have more opportunities than others to observe substance use and its positive functions.... They are also more likely to overestimate the proportion of their peers who use these substances—because they are likely to be associating with groups who actually do use .... [and] deviant cultures reinforce these youth when they do use, for example, by acceptance into groups" (p. 369).

Leventhal et al. (1991) observe that parents, teachers, and other adults seldom discuss with youth the intense biological and social changes that occur in adolescence: "When such a dialogue is absent ... the peer group becomes the predominant influence integrating and shaping the adolescents' vague yet pressing internal states" (p. 586).

Participation in Athletics and Other Health-Enhancing Behaviors

Health-enhancing behaviors, such as sports involvement, might moderate a high-risk environment (Rantakallio 1983). Swan, Creeser, and Murray (1990) found that girls were significantly less likely to begin smoking if they were involved in an organized sport, but were significantly more likely to begin smoking if they participated in organized social activities. Involvement in sports did not appear to affect boys' rate of smoking onset in this study. McCaul et al. (1982) found no association between boys' smoking and participation in extracurricular activities. Among urban black females in Brunswick and Messeri's (1984) study, those who reported minimal concern about their health and those who reported a larger appetite were more likely to begin smoking; in contrast, black males who had the greatest number of health-related activities and were of normal body weight were more likely to begin smoking than other black males (Brunswick and Messeri 1983). Sussman et al. (1993) found that among youth at the highest risk of smoking, those who did not smoke reported that they valued their health. Finally, in Kelder's (1992) longitudinal study of secondary school students in the north-central United States, cigarette smoking was found to be related to poor food choices and less exercise after the eighth grade; the correlation between these behaviors was stronger with increasing age.

Behavioral Skills

The final set of behavioral factors comprises the behavioral skills that are necessary to begin smoking, those that are necessary to resist influences to smoke, and those that are necessary to cope with other social situations that might indirectly encourage cigarette use. Hahn et al. (1990) found that 42 percent of smoking experimenters had asked for their first cigarette. In the Sussman et al. (1987) study in southern California, difficulty in refusing offers to smoke predicted onset for all four ethnic groups, particularly for whites and blacks, for whom it was the strongest predictive factor found in the study. This difficulty in refusing an offered cigarette appears to be strongly influenced by the offering friend's attitudes and behaviors (e.g., being persistent or critical if refused), particularly for high-risk adolescents (Salomon et al. 1984; Lawrance and Rubinson 1986; Reardon, Sussman, Flay 1989). Conrad, Flay, and Hill (1992) reviewed three prospective studies and found that refusal or resistance skills against smoking were associated with lower rates of onset.

Generally, cigarette use can be viewed as a coping mechanism—a skilled response designed to close the gap between an adolescent's current position and goals (Leventhal et al. 1991). Smoking serves as a coping response if it brings the adolescent closer to a valued goal, such as acceptance in a peer group. Smoking may also serve as a coping response to stress or distress (Wills and Shiffman 1985; Castro et al. 1987). These studies suggest that youth need more general social skills, such as being able to cope with various kinds of stress or social pressures, to help them manage the many developmental demands of adolescence (Franzkowiak 1987). A more comprehensive concept of skills that has been used in prevention efforts is discussed in Chapter 6 (see "Instilling Skills for Resisting Social Influences to Smoke" and "Exemplary Programs for Resisting Social Influences").

Personal Factors in the Initiation of Smoking

Personal factors are those that are inherent in the individual; they include cognitive processes, values, personality constructs, and psychological well-being. These factors can be considered the personal filters through which sociodemographic and environmental factors pass as they influence behavior. Personal risk factors also explain differences in behavior among individuals exposed to the same or similar environments. The personal factors that have been examined in the research literature include levels of knowledge about the health consequences of smoking, the functions or meanings of cigarette use among adolescents, the subjective expected utility (SEU) of smoking, self-esteem, self-image, self-efficacy in refusing offers of cigarettes, personality variables, and emotional well-being.

Knowledge of Long-Term Health Consequences

Knowledge of the long-term health consequences of smoking has not been a strong predictor of adolescent onset (Collins et al. 1987; Krohn, Naughton, Lauer 1987; Sussman et al. 1987; Conrad, Flay, Hill 1992; Royal College of Physicians of London 1992), perhaps because virtually all U.S. adolescents—smokers and nonsmokers alike—are aware of the long-term health effects of smoking and because many adolescents feel inherently invulnerable in their characteristically short-term view (Gerber and Newman 1989). Belief that smoking has short-term effects on health appears to be a more powerful influence than knowledge of long-term health effects (Krohn, Naughton, Lauer 1987; McNeill et al. 1988). Similarly, belief in personally relevant negative social consequences of smoking has been associated with a decline in smoking prevalence among secondary school students (Chassin et al. 1987). Botvin et al. (1992) found that lack of concern about the harmful effects of smoking was associated with intentions to smoke among young, inner-city black adolescents. Similarly, dismissing or minimizing the health consequences of smoking has been associated with both initiation of cigarette use and adult smoking levels (Mittelmark et al. 1987; Swan, Creeser, Murray 1990). Krohn, Naughton, and Lauer (1987) found that smoking behavior predicted beliefs about the health effects of smoking more than beliefs predicted future cigarette use. Knowledge of the health consequences of smoking may or may not deter some adolescents from beginning to smoke; beginning to smoke appears to accentuate adolescents' denial of the health consequences.

Functional Meanings of Adolescent Smoking

The question of why adolescents begin to smoke has led to multiple examinations of the meanings of cigarette use, the utility of smoking, and the functions that smoking serves in an adolescent's life (Leventhal and Cleary 1980; Perry, Murray, Klepp 1987). Examining smoking from the perspective of the adolescent is a departure from viewing the onset of smoking exclusively as a response to the social environment or as capricious, arbitrary behavior. Since knowledge of the harmful consequences of cigarettes does not appear to deter onset, researchers are examining the social reasons and purposes of smoking.

Adolescents who begin to smoke perceive a more functional purpose of smoking than those who are nonsmokers (Gerber and Newman 1989). Adolescent smokers are more likely to view smoking as a way to act mature, be accepted by a peer group, have fun, cope with personal problems and boredom, or be rebellious (Perry, Murray, Klepp 1987). Cigarette smoking has also been shown to be a coping behavior for adolescents who are dealing with disruptive and stressful family events (Castro et al. 1987). Hunter et al. (1987) found that adolescent smokers were significantly more likely than nonsmokers to believe that smoking has psychological and physiological benefits. They were also less likely to believe that others smoked for negative reasons, such as to "show off."

In the research of Hahn et al. (1990), regular smokers were asked why they first had tried cigarettes and why they had most recently smoked. Sixty percent reported that curiosity was the reason for their first try, 13 percent said that they wanted to fit in with a group, and 10 percent reported that they were pressured into it. For most recent use, 27 percent reported that they smoked for pleasure, 20 percent out of dependence, 17 percent because they were curious, and 10 percent to fit in with the group. These findings are consistent with Chassin et al. (1984), who suggest that positive attitudes toward smoking, such as the idea that smoking is fun or pleasurable, are a better predictor of the transition to regular smoking than they are for first experimentation. In general, these investigators found that positive attitudes toward smoking may increase as a function of age. Botvin, Botvin, and Baker (1983) found that independent of the smoking status of friends, students in the eighth grade (13- and 14-year-olds) were more likely to have a positive social image of smoking than students in the seventh grade (11- and 12-year-olds).

Subjective Expected Utility

Bauman et al. (1984) have examined the SEU of smoking for adolescents in a longitudinal study in North Carolina. SEU is defined as the extent to which an individual expects the overall consequences of a behavior, such as smoking, to be positive or negative. Fishbein (1980) found that behavioral intentions to smoke were related to whether more positive or negative consequences were expected from smoking. SEU was found to be predictive of the onset of smoking over a one-year interval and of increased smoking levels among baseline smokers (Bauman et al. 1984). In a second study, SEU was found to be mediated by the adolescent's perception of personal control; current smokers with the highest scores for internal locus of control (that is, the belief that they have control over what occurs to them) were more likely to have been influenced by SEU (Bauman and Fisher 1985). Therefore, regular smoking appears more likely to be motivated by internal processes than are initiation and trying, which may primarily be products of exposure to a high-risk social environment.

Self-Esteem

The process of individuation and identity formation is inherent to adolescence. The adolescent's sense of self evolves as she or he interacts with parents, school, and peers and considers options for the future. Self-esteem, or an individual's qualitative self-evaluation, emerges from these contexts (Young and Werch 1990). In several studies, the onset of smoking has been associated with lower self-esteem. Young and Werch (1990) found that young nonsmokers and those with no intention of smoking in the future had higher self-esteem relative to family, school, and peers than frequent users or those who intended to use in the future. Ahlgren et al. (1982) found that low self-esteem within family or school contexts was associated with initiation and continuance of smoking. Self-esteem concerning school predicted intentions to smoke among young, inner-city black adolescents (Botvin et al. 1992) but did not predict actual smoking. Stacy et al. (1992) found that general low self-esteem directly predicted smoking onset in a multiracial, southern California sample yet did not significantly mediate friends' social influences. In their review of prospective research, Conrad, Flay, and Hill (1992) conclude, "Self-esteem received fairly consistent support [as a predictor of initiation] from the reviewed longitudinal studies. This is better than we would have expected from our reading of previous cross-sectional studies" (p. 20).

Self-Image

Some adolescents may smoke cigarettes to enhance their low self-esteem by improving their external image—that is, by appearing mature or "cool." Smoking onset was seen as a way to improve self-image among whites, blacks, and Hispanics in southern California (Sussman et al. 1987). Role models who smoke are frequently seen to have socially desirable attributes—they seem tough, sociable, and sexually attractive (Chassin, Presson, Sherman 1990). Adolescents who believe that smoking bestows these attributes may see smoking as a powerful mechanism for self-enhancement. These young people may experiment with smoking to try to adopt a perceived positive social image and thereby improve the way others, particularly peers, view them (Chassin, Presson, Sherman 1990; Leventhal et al. 1991). If peers respond favorably to this strategy, these new young smokers may continue to smoke, since the behavior has proved functional for them in creating an acceptable self-image.

Self-Efficacy

An individual's efficacy (or confidence) in performing specified skills and behaviors is a significant mediator of peer influences to smoke (Bandura 1986). Ellickson and Hays (1990–91) found that low self-efficacy, as measured on a scale of having little or much confidence in resisting offers of drugs, was associated with drug use, including smoking. DeVries, Kok, and Dijkstra (1990) found that self-efficacy in resisting offers to smoke was the best predictor of smoking among adolescents in the Netherlands over a one-year interval. Similarly, Lawrance and Rubinson (1986) found that young adolescents' perceptions of their ability to resist cigarette smoking corresponded to their self-reported smoking. Finally, Stacy et al. (1992) found in their cross-sectional study of high school students not only that low self-efficacy in resisting social influence was a significant predictor of smoking, but also that high self-efficacy was the only significant mediator of friends' social influences on smoking. Therefore, self-efficacy, a personal factor, appears to act as a buffer that protects adolescents from potent peer influences to smoke (Conrad, Flay, Hill 1992).

Personality Factors

The research on personal factors has also examined many personality factors for their association with onset, in part to assess whether underlying emotional or psychological problems predict adolescent smoking. Personality characteristics that are related to deficiencies in self-control, such as impulsiveness and sensation-seeking tendencies, are important and were discussed earlier in this chapter in connection with behavioral factors.

Psychological Well-Being

Several studies have associated cigarette smoking and symptoms of depression among adolescents. Covey and Tam (1990) showed an independent relation of depressive mood, friends' smoking behavior, and living in a single-parent home with cigarette smoking among 205 urban 11th-grade males and females. Depression scores correlated with the number of cigarettes smoked. Malkin and Allen (1980) found a significant association between smoking and depression among males in a study of 229 rural 8th- and 11th-grade students, a finding that was replicated for both genders by Kaplan et al. (1984).

Stein, Newcomb, and Bentler (unpublished data) found that cigarette use was positively associated with being extroverted and negatively associated with having symptoms of depression among junior high school students in Los Angeles. Cigarette use, however, significantly predicted symptoms of depression in these young people four and eight years later (Newcomb, McCarthy, Bentler 1989). These findings may reflect the addictive quality of tobacco use beyond the earliest experimental states and the relationship between smoking and depression, since depression is a personality factor that usually persists over time. Smoking might be a short-term, self-medicating response to symptoms associated with depression. In the long-term, however, this effect would diminish; as tolerance to nicotine increases, the possible antidepressant effects of smoking (such as alertness, euphoria, and calm) dissipate (Newcomb, McCarthey, Bentler 1989). Similarly, Leventhal, Fleming, and Glynn (1988) found that reported feelings of helplessness were associated with more rapid movement to a second and third experiment with smoking; however, these feelings were not related to the initial experimentation. The association of smoking and suicide attempts, another clearly serious symptom of depression, is presented in Chapter 3 (see "Cigarette Smoking and Other Health-Related Behaviors").

Flay (1993) suggests that symptoms of depression may be a response to distress associated with stress and poor family bonding. He points out that stress and distress have been associated with drug use, including tobacco use (Wills and Shiffman 1985). The research of Kellam, Ensminger, and Simon (1980) suggests that this cycle may begin early in life. In their study of first-graders (aged five through seven) in Chicago, they found that males rated by observers as aggressive or as alternately shy and aggressive had the highest rate of drug use, including cigarette use, 10 years later; no long-term psychological predictors were found for females. In another study (Brunswick and Messeri 1984), adolescent males were more likely to begin smoking if they were pessimistic about the likelihood of the world becoming any better or if they held low expectations for their own future; for adolescent females, a shortened time perspective (i.e., a limited ability to conceptualize their future) was the most important psychogenic predictor of initiation.

Adolescent Smoking Behavior as a Risk Factor for Subsequent Smoking

Intentions to Smoke

Since intentions are viewed as proximal to performance, the research on smoking behavior as a predictive factor of smoking includes behavioral intentions to smoke. In several studies, intentions to smoke have been associated with both the onset and continuation of smoking. Sussman et al. (1987) found in their longitudinal study in southern California that the intention to start smoking was one of only three factors that predicted onset among all ethnic groups. McNeill et al. (1988) found that future intentions to smoke increased the odds of starting to smoke by a factor of 2.44 and was the strongest predictor of change in smoking status after current behavior (having tried smoking) and gender were entered into the analysis. In the Chassin et al. (1984) longitudinal study, behavioral intentions were "significant predictors of future smoking transition in all subgroups, accounting for between 1.9 percent and 10.2 percent of the variance in transition. . . . In fact, behavioral intentions were typically the most important single predictor of future transition" (p. 237).

Intentions to smoke appear to be a particularly strong predictor of future smoking for those who have already tried smoking. Shean (1991) found that intentions to smoke a "next cigarette" among 14-year-old Western Australians predicted smoking eight years later. Conrad, Flay, and Hill (1992) found that in eight of nine prospective studies of young adolescents, the intention to smoke was significantly associated with onset. Because of the strength of this association, several researchers have used intentions to smoke as an outcome measure in their studies, especially in populations (such as preadolescents) where smoking prevalence is low relative to adolescents' intentions to smoke. Intentions to begin smoking seem a much more reliable predictor of future behavior than do intentions to quit smoking (see "Adult Implications of Adolescent Smoking" in Chapter 3).

Present Smoking Status

Any cigarette use places an adolescent at higher risk for subsequent use and for further progression through the stages of smoking behavior. Conrad, Flay, and Hill (1992) document seven prospective studies in which prior experience with, or exposure to, smoking predicted tobacco use. McNeill et al. (1988) found that the act of having tried smoking was the most predictive factor in initiation and that it more than quadrupled their study participants' odds of taking up smoking. Collins et al. (1987) found that prior smoking behavior was the most important predictor of future smoking over a 2.5-year interval. Even though the physiological effects of the first tries are mostly adverse (unpleasant taste, coughing, headache, nausea, dizziness) (Hahn et al. 1990), those who persist report increasingly positive reactions (pleasant taste, euphoria, alertness, relaxation, curbing of appetite) and develop tolerance (experience fewer unpleasant sensations) (Flay 1993). Stein, Newcomb, and Bentler (unpublished data) reported a more established pattern of cigarette use among young adults than among adolescents. In their study, the standardized regression coefficient of prior smoking for smoking behavior between Year 1 and Year 5 (youth in junior high and high school age groups) was 0.43, yet from Year 9 to Year 13 (young adulthood) it was 0.82. The authors suggest that in early adolescence, some cigarette triers never fully develop a pattern of smoking, but by late adolescence, the addictive properties of cigarette use figure prominently in behavior formation. These findings underscore the need for antismoking efforts to focus on preventing initial tries, on discouraging transitions to more regular smoking, and on encouraging early cessation (Leventhal, Fleming, Glynn 1988; Kelder 1992).

Summary of Psychosocial Risk Factors for Cigarette Smoking

Some clear convergence of research findings emerges from this review, a summary of which is highlighted in Table 1. Table 3 provides a second summary of supportive and unsupportive findings from the Conrad, Flay, and Hill (1992) review of 27 prospective studies; for the most part, this summary table is consistent with Table 1. Among the sociodemographic factors, age is the risk factor consistently linked with onset in early adolescence; ages 11 through 15 (seventh through ninth grades) are the peak age group for first trial and experimentation. Cigarette smoking clearly has social meanings that are attractive to many young and vulnerable identity-seeking adolescents. This age factor is even more pronounced when linked with SES, another important sociodemographic risk factor for smoking onset. Alternative health-enhancing avenues for independence and identity may be less readily available to adolescents from lower SES families, especially those adolescents who live in a single-parent home. Limited by fewer opportunities for healthy development and parental supervision, lower-SES youth are generally at greater risk to begin smoking. The gender difference, another major factor, is no longer evident, although the meanings of cigarette use and the pathways to regular use may vary by gender. Finally, differences by ethnic group do not appear to show a consistent pattern across communities, particularly when income level and cigarette availability are considered. The review of sociodemographic factors thus concludes that a young adolescent from a low-SES family is at highest risk to begin smoking.

Proximal environmental factors, such as the influence of peers, friends, and siblings, play a powerful role in the initiation of adolescent smoking. Smoking initiation appears to be a component of peer associations and peer bonding in adolescence, as peer groups establish shared behaviors to differentiate themselves from other adolescents and from adults. Adolescents usually try their first cigarettes with their peers; peer groups may subsequently provide expectations, reinforcement, and opportunities for continuation. The influence of peers seems to be particularly potent in the stages of smoking that precede regular use; in later stages, personal and pharmacological factors appear to predominate.

Data on the influence of parental smoking are not as compelling as those on peer influence; only about half of the prospective studies show a clear predictive relationship. The influence of parental smoking appears to be strongest for whites and females, particularly in the early stages of smoking onset. This review suggests that parental influence might include other important factors, such as parents' approval or disapproval of smoking, their involvement in free-time supervision, their manner and extent of communication on health-related matters, or their promotion or nonpromotion of academic achievement for their children. Lastly, young people are exposed not only to role models but also to the consequences of the behavior of these role models; having a parent who smokes might even serve to deter an adolescent from smoking if the parent is struggling with cessation or displays the health consequences of tobacco use.

How adolescents perceive their social environment also influences their smoking behavior. Adolescents overestimate the number of young people and adults who smoke, and those with the highest estimates are more likely to become smokers. In addition, young people are more likely to smoke if they feel that their peers approve of smoking, and particularly if adults do not seem to disapprove. In each of these cases, the perceived environment could accurately reflect the actual environment. Those who begin to smoke may actually be exposed to more role models who smoke, more peers who approve of smoking, and fewer adults who disapprove than those who never begin to smoke.

Families in which parents are considered to be generally concerned and supportive, or in which the children are involved in family decisions, are home environments in which adolescents are less at risk for smoking initiation. Parental strictness and parental approval or disapproval of smoking have indirectly and inconsistently predicted initiation and are therefore less influential on adolescent smoking behavior than the general family environment. The research on parental skills in coping with adolescent smoking is limited and warrants further investigation.

The behavioral factors examined were consistently associated with the initiation of cigarette smoking. Patterns of behavior that are associated with smoking include alcohol and drug use, risk-taking and rebellious actions, and involvement in peer groups in early adolescence. Patterns of behavior that are associated with less risk of smoking include academic achievement, involvement in sports (for females), healthy eating and physical activity patterns, and the ability to resist offers of cigarettes. Thus, encouraging and providing opportunities for health-enhancing activities and academic achievement might, by fulfilling some of the needs that smoking apparently meets for adolescents, prevent some young people from trying their first cigarette.

The personal factors—those most proximal to the individual and to the immediate decision to smoke a cigarette—reflect, in part, the adolescent's internalization of the social environment. An adolescent's knowledge of the health consequences of smoking is a poor predictor of subsequent cigarette use, although smoking risks that are personalized appear to be important. More significant predictors include the meanings, the perceived positive functions, and the expected utility of cigarette use. These aspects are linked to having a positive social image, bonding with peers, and being "mature"—all of which are particularly socially relevant for adolescents. Compared with nonsmoking adolescents, those who begin to smoke appear to have lower self-images and lower self-esteem; for them, smoking becomes a self-enhancement mechanism. Similarly, self-efficacy toward avoiding cigarettes seems particularly linked with the ability to resist cigarette offers from peers. Of the personality variables, symptoms of depression, helplessness, aggression, pessimism, and a limited ability to conceptualize the future were all found to be smoking-predictive in a small number of studies. The most predictive personal factors were those linked to the social environment, to peers, and to the meanings of cigarette smoking learned in youth.

Intentions to smoke and prior experimentation with cigarettes strongly predict subsequent smoking. The adverse physiological reactions to first tries at smoking wane with repetition, and tolerance levels to nicotine increase. Adolescents who smoke are more likely than nonsmokers to discount the negative health consequences of smoking, report positive functions of smoking, and perceive that their peers are smokers. The shift from social to more personal reasons for smoking is associated with increasing nicotine dependence and addiction.

Several other factors that influence smoking initiation are not covered in this chapter. First, the combined influence of tobacco advertising and promotion represents a powerful environmental risk factor (see Chapter 5). Second, cultural or community-level research on the causes of smoking onset is decidedly limited. In particular, the effect of taxation, of restrictions to public smoking, of vending machine regulations, and of limiting access to tobacco for underage buyers needs to be addressed prospectively (Chapman and Bloch 1992; Sweanor et al. 1992; see Chapter 6). Third, even at the school level, smoking prevalence rates have been shown to be partly attributable to attendance at a particular school and to school smoking policies (Best et al. 1984; Semmer, Lippert, et al. 1987; Pentz et al. 1989; Santi et al. 1990–91; see "Smoking Restrictions in the School" in Chapter 6). Still, which aspects of schools contribute to smoking onset—whether their rules, consistency of rule enforcement, grade structure, or discipline procedures—need to be studied. These distal environmental factors partly determine the meaning for, and acceptability of, cigarette use at a community level, determine the ease or difficulty with which adolescents can obtain tobacco, and reinforce or inhibit the continuation of use into adulthood. Proximal factors are strong determinants of use once the meaning of smoking is established and access to cigarettes is possible. Therefore, the more distal risk factors might be considered the proper targets of intervention research efforts, which should test the potency of these factors and provide the clear community-level message that cigarette smoking among the young is unacceptable.

Initiation of Smokeless Tobacco Use

Compared with the research literature on smoking initiation, the knowledge base on smokeless tobacco initiation is modest. Far fewer longitudinal studies have been conducted. For the most part, research efforts on smokeless tobacco have been cross-sectional; a few have also been guided by behavioral theory. Nonetheless, a number of methodologically sound studies provide knowledge about the risk factors associated with the initiation of smokeless tobacco use. In parallel with the research on cigarette smoking among young people, sociodemographic, environmental, behavioral, and personal factors have all been explored as correlates of smokeless tobacco use. With only a few exceptions, the consistency of the findings with those found for cigarette smoking suggests that both smoking and the use of smokeless tobacco products share a common causality as well as similar functions and meanings for young people.

Sociodemographic Factors in the Initiation of Smokeless Tobacco Use

National survey data on the demographics of smokeless tobacco use are presented in detail in Chapter 3 (see "Recent Patterns of Smokeless Tobacco Use") and are only summarized here. These data clearly indicate that smokeless tobacco use among young people is particularly prevalent among non-Hispanic white males. The three youth surveys that assessed smokeless tobacco prevalence (that is, use during the month preceding the survey) also found that males were 10 to 15 times more likely than females to use smokeless tobacco. Although nationally representative data on American Indian and Alaskan Native youth are not available, community-level studies of these populations have reported high rates of weekly smokeless tobacco use among both males (43 percent) and females (34 percent), even at very young ages (Schinke et al. 1987, 1989; Bruerd 1990).

The Monitoring the Future Project survey, a national survey of high school seniors, indicated that 54 percent of males had used smokeless tobacco. Among those, 23 percent first used smokeless tobacco before or during the sixth grade, and over 53 percent first used it before or during the eighth grade (see "Grade When Smokeless Tobacco Use Begins" in Chapter 3). Data from a number of other recent surveys suggest that early adolescence is the peak age for first using smokeless tobacco (Schaefer et al. 1985; US Department of Health and Human Services [USDHHS] 1986; Ary, Lichtenstein, Severson 1987; Ary et al. 1989; Riley, Barenie, Myers 1989; Brownson et al. 1990; Riley et al. 1990, 1991).

Limited evidence suggests that the following sociodemographic factors may also be related to higher rates of smokeless tobacco use among youth: one or no parents in the household (Jones and Moberg 1988; Murray et al. 1988; see "Sociodemographic Risk Factors for

Smokeless Tobacco Use" in Chapter 3); lower parental education (Bauman, Koch, Lentz 1989; Botvin, Baker, Tortu 1989); blue-collar parental occupation (Burke et al. 1989; Elder, Molgaard, Gresham 1988; Novotny et al. 1989); and rural environment (Olds 1988; Botvin, Baker, Tortu 1989; Rouse 1989; Lisnerski et al. 1991; see "Sociodemographic Risk Factors for Smokeless Tobacco Use" in Chapter 3). As is reported in Chapter 3 (see "Current Use of Smokeless Tobacco"), prevalence varies among regions and is somewhat lower in the Northeast than in other regions.

Environmental Factors in the Initiation of Smokeless Tobacco Use

Factors That Influence Acceptability and Availability

Ease of access to smokeless tobacco appears to be an important factor in initiation, and young people seem to have little trouble obtaining smokeless tobacco (USDHHS 1992a, CDC 1993). In interviews conducted by the Office of Inspector General (USDHHS 1986), 90 percent of smokeless tobacco users in junior and senior high school reported that they purchased their own smokeless tobacco; 94 percent reported that although they were minors, it was either never or only rarely difficult for them to purchase smokeless tobacco. Convenience stores were the most frequent purchase site (55 percent); supermarkets and grocery stores accounted for an additional 33 percent of sales. Barovich et al. (1991) found that 50 percent of store personnel were willing to sell to minors. In another study (Leopardi et al. 1989), junior high school students reported that their leading sources of smokeless tobacco were friends (43 percent) and direct store purchase (30 percent); senior high school students' chief sources were direct purchase (62 percent) and friends (25 percent). In a recent study in Texas, minors successfully purchased smokeless tobacco in 59 percent of stores selling the product (CDC 1993).

Interpersonal Factors

Parental Use

As in the research on cigarette smoking, the evidence depicts either a modestly positive or no significant association between parental use of smokeless tobacco and adolescent use. The only prospective study that examined parental use found no link to onset or continued use of smokeless tobacco among youth (Ary, Lichtenstein, Severson 1987). However, several cross-sectional studies have reported significant relationships between concurrent use by parents and youth (Cohen et al. 1987; Hall and Dexter 1988; Colborn, Cummings, Michalek 1989; Glover et al. 1989; Brownson et al. 1990). Bauman, Koch, and Lentz (1989) found that an adolescent was more likely to use smokeless tobacco if the father did, although there was an interaction with the level of the father's education. Two cross-sectional studies found no significant association between concurrent use of smokeless tobacco by parents and adolescent offspring (Chassin et al. 1985; Ary, Lichtenstein, Severson 1987).

Sibling Use

The evidence from cross-sectional studies generally supports a relationship between a sibling's use of smokeless tobacco and an adolescent's use. However, one prospective study did not find significant sibling relationships (Ary, Lichtenstein, Severson 1987), and another study found no effect for "older family members" (Chassin et al. 1985). The sole longitudinal study did not find that sibling use was related to adolescent onset (Ary, Lichtenstein, Severson 1987).

Peer Use

Although a substantial amount of cross-sectional research has examined the use of smokeless tobacco by peers, only two longitudinal studies have been published. Every cross-sectional study found that peer use was significantly related to adolescent use (Cohen et al. 1987; Hall and Dexter 1988; Lucas and Christen 1988; Glover et al. 1989; Leopardi et al. 1989; Riley, Barenie, Myers 1989; Brownson et al. 1990; Hunter, Vizelberg, Berenson 1991). Peer use of smokeless tobacco was related to the onset of adolescent use at the 9-month follow-up in one longitudinal study (Ary et al. 1989) but not in another study (Ary 1989) at the 6- and 12-month follow-up times. However, peer use was found to be related to continued use among initial daily users of smokeless tobacco at 6-, 9-, and 12-month follow-ups (Ary, Lichtenstein, Severson 1987; Ary 1989).

Perceived Environmental Factors

Norms

Current evidence indicates that most adolescents who use smokeless tobacco perceive that this behavior is socially acceptable. The Office of Inspector General (USDHHS 1986) reported the following findings from a survey of male adolescents who used smokeless tobacco:

- 86 percent perceived that most or some students at their school approved of smokeless tobacco use.

- 98 percent said their best male friends either approved of, or were neutral toward, their smokeless tobacco use.

- 93 percent said their parents knew of their smokeless tobacco use.

- 68 percent said their fathers and 45 percent said their mothers approved of, or were neutral toward, their smokeless tobacco use.

- 91 percent said their brothers and 71 percent said their sisters either approved of, or were neutral toward, their smokeless tobacco use.

- 87 percent listed their home as a setting where they regularly used smokeless tobacco.

- 43 percent whose dentist knew of their use were not advised by that professional to quit.

- 51 percent said their coaches either approved of, or were neutral toward, their smokeless tobacco use.

These findings were replicated in the 1992 Office of the Inspector General study on Spit Tobacco and Youth (USDHHS 1992b). The adolescents in this study who used smokeless tobacco said that the greatest influences on their trying smokeless tobacco were peer pressure and other family members' use. The majority of these young users felt their parents would agree that their using smokeless tobacco was preferable to smoking cigarettes (USDHHS 1992b).

In another study, only 14 percent of smokeless tobacco users reported that their father disapproved of their smokeless tobacco use, whereas 60 percent said their mother disapproved (Marty, McDermott, Williams 1986). Williams et al. (1986) found that 55 percent of smokeless tobacco users indicated that their parents disapproved of their use. In a study by Ary et al. (1989), only 13 percent of daily smokeless tobacco users reported that their dentist had said anything to them about their use. Brubaker and Loftin (1987) found that smokeless tobacco users reported greater peer acceptance of, and less parental opposition to, their use than did nonusers.

Social Support

Chassin, Presson, and Sherman (1988) examined the relationship between family social support and current use of smokeless tobacco. Three cross-sectional analyses found no pattern of relationships between smokeless tobacco use and perceived parental expectations (for success or academic accomplishment), parental supportiveness, parental strictness, agreement between parents, parent–peer agreement, or the adolescent's reported motivation to comply with parents. Similarly, two sets of analyses examining one-year prediction of smokeless tobacco onset found no statistically significant effects for the same set of factors, although the statistical power to detect such effects was minimal because the sample contained few cases of smokeless tobacco onset.

Parental Reaction to Smokeless Tobacco Use

Parents appear to be more accepting of smokeless tobacco use than of cigarette smoking. About 40 percent of high school smokers reported that their parents knew about their smoking, whereas smokeless tobacco users reported that 71 percent of their parents knew of their use (Chassin et al. 1985). Similarly, young people who did not use tobacco reported that their parents and peers were more accepting of smokeless tobacco use than of smoking (Chassin et al. 1985; Ary et al. 1989). These findings suggest that adolescents may begin using smokeless tobacco partly because they perceive that it is less deviant than smoking or other drug use and therefore is more likely to be accepted by their peers and parents (Hahn et al. 1990).

Some research evidence indicates that the anticipated parental response to an adolescent's use of smokeless tobacco is related to that youth's likelihood of using smokeless tobacco. Riley, Barenie, and Myers (1989) found that high school students' anticipation of their parents' response was highly predictive of the first trial of smokeless tobacco and of the level of continued use. Brubaker and Loftin (1987) found that adolescents who did not currently use smokeless tobacco but who intended to become users reported that it would be unlikely that their parents would respond by taking away their privileges, reprimanding them, becoming angry, expressing disappointment, or prohibiting them from continued use. These youth also reported that it was likely that their parents would ignore their smokeless tobacco use.

Behavioral Factors in the Initiation of Smokeless Tobacco Use

Academic Achievement

For males, smokeless tobacco use was related to poor academic performance (Jones and Moberg 1988) and to a low grade point average (Brownson et al. 1990). The NIDA national household survey indicated that for males, the prevalence of daily use of smokeless tobacco was highest among school dropouts (13 percent) and lowest among college students (6 percent) (Rouse 1989).

Smoking as a Risk Factor for Smokeless Tobacco

Five longitudinal studies examined the prospective relationships between cigarette smoking and the onset or continued use of smokeless tobacco (Ary, Lichtenstein, Severson 1987; Dent et al. 1987; Murray et al. 1988; Ary 1989; Sussman et al. 1989). (The relationship between smokeless tobacco use and subsequent cigarette smoking is reviewed later in this chapter.) In a longitudinal study of eighth graders, Dent et al. (1987) reported that smoking status at baseline predicted the onset of smokeless tobacco use one year later. Twenty-nine percent of regular smokers at baseline—but only 6 percent of those who had never smoked—reported smokeless tobacco onset at follow-up. Ary, Lichtenstein, and Severson (1987) used discriminant analysis to identify predictors of the onset of smokeless tobacco use nine months after smoking onset among 7th, 9th, and 10th graders. The discriminant function accounted for 11 percent of the variance, and having tried smoking was an important predictor, correlating at 0.64 with the discriminant function. In a similar study using a separate sample of 7th, 9th, and 10th graders in Oregon, smoking did not significantly predict smokeless tobacco onset at 6-month or 12-month follow-ups (Ary 1989). Another longitudinal study found general support for the influence of smoking on seventh graders who had tried smokeless tobacco (Murray et al. 1988). Longitudinal analysis of one-year follow-up data from two other samples of seventh graders indicated that both males and females exhibited a fairly consistent relationship between the onset of smokeless tobacco use and pretest smoking (Sussman et al. 1989).

Three of the longitudinal studies cited above also examined the prospective relationship between cigarette smoking and continued use of smokeless tobacco among adolescents. Ary, Lichtenstein, and Severson (1987) found that baseline smoking did not predict frequency of later smokeless tobacco use at nine-month follow-up. In a separate study, Ary (1989) examined these relationships and found that frequency of smoking was related to continued daily smokeless tobacco use at 12-month follow-up but not at 6-month follow-up. A 24-month follow-up study of ninth graders also found general support for the influence of smoking on later use of smokeless tobacco (Murray et al. 1988). Although the findings from these three prospective studies are inconclusive, numerous studies report significant concurrent relationships between smoking and smokeless tobacco use. The degree of statistical power exhibited by these relationships varied widely, but every study found at least one significant association between smokeless tobacco use and smoking.

Other Adolescent Behaviors

Twelve studies fairly consistently indicated that smokeless tobacco use is related to concurrent use of alcohol and marijuana (Lichtenstein et al. 1984; Ary, Lichtenstein, Severson 1987; Burke et al. 1988, 1989; Jones and Moberg 1988; Murray et al. 1988; Ary 1989; Riley, Barenie, Myers 1989; Rouse 1989; Sussman et al. 1989; Riley et al. 1991; Stevens et al. 1991). One of these studies (Sussman et al. 1989) found that seventh- and eighth-grade females showed no relationship between having tried smokeless tobacco and concurrently using alcohol, but two of four samples with male subjects showed significant relationships. Only three studies examined the prospective relationships between smokeless tobacco use and the use of alcohol and marijuana. In one study, the onset of smokeless tobacco use among those who had not used at baseline was related to marijuana use but not to alcohol use (Ary, Lichtenstein, Severson 1987). In a separate study, initial use of alcohol or marijuana did not predict onset of smokeless tobacco use at 6-month follow-up, but initial alcohol use predicted smokeless tobacco use at 12-month follow-up (Ary 1989). In another 12-month longitudinal study, onset of smokeless tobacco use among those who at baseline had never used smokeless tobacco was predicted by initial alcohol use in one of two samples of seventh-grade females but not in two samples of males (Sussman et al. 1989). Taken together, there is some evidence that prior use of either alcohol or marijuana is related to subsequent onset of smokeless tobacco use and to continued use of smokeless tobacco among daily users.

Several studies suggest that adolescents who use smokeless tobacco are more likely to use multiple drugs than are adolescents who do not use smokeless tobacco. Ary, Lichtenstein, and Severson (1987) found that among male adolescents who reported use of smokeless tobacco, cigarettes, alcohol, or marijuana in the week preceding the survey, 43 percent (47 percent in Ary's separate study [1989]) indicated that they used more than one of these substances during that week. The percentage of daily users of smokeless tobacco who reported use of alcohol during the preceding week was particularly high (76 percent in Ary, Lichtenstein, and Severson's study [1987] and 74 percent in Ary's separate study [1989]). Among daily smokeless tobacco users, 83 percent in Ary, Lichtenstein, and Severson's study (1987) (80 percent in Ary's 1989 study) also reported using a drug other than alcohol, a fact suggesting that daily smokeless tobacco users are particularly likely to be multiple drug users.

Smokeless Tobacco Use as a Risk Factor for Smoking, Alcohol, and Other Drug Use

Although the known literature indicates that the use of cigarettes and other drugs is a risk factor for smokeless tobacco use, several studies also indicate that the converse is true; that is, smokeless tobacco use is a risk factor for the onset and maintenance of cigarette smoking and for the use of alcohol and marijuana (see "Smokeless Tobacco Use and Other Drug Use" in Chapter 3). Ary, Lichtenstein, and Severson (1987) examined the prospective relationship between smokeless tobacco use and the onset of the use of cigarettes, alcohol, and marijuana at nine-month follow-up. Smokeless tobacco users were found to be more likely than nonusers to begin using cigarettes (22 percent vs. 7 percent), alcohol (18 percent vs. 7 percent), and marijuana (37 percent vs. 18 percent). These findings were replicated in Ary's (1989) 12-month follow-up study of a separate sample. Smokeless tobacco users were significantly more likely than nonusers to report smoking cigarettes (6 percent vs. 0.5 percent), drinking alcohol (29 percent vs. 12 percent), and smoking marijuana (12 percent vs. 2 percent).

Similarly, smokeless tobacco users were more likely than nonusers to increase their use of other drugs. A greater proportion of smokeless tobacco users than of nonusers reported increased use (in the week preceding the survey) of cigarettes (18 percent vs. 8 percent), alcohol (34 percent vs. 20 percent), and marijuana (20 percent vs. 8 percent) (Ary, Lichtenstein, Severson 1987). The 1989 study replicated these findings for each substance: cigarettes (7 percent vs. 2 percent), alcohol (25 percent vs. 13 percent), and marijuana (15 percent vs. 2 percent) (Ary 1989).

Several studies provide additional evidence for the progression from smokeless tobacco to other drugs. In one, decreases in smokeless tobacco use were accompanied by increases in cigarette smoking (Hunter et al. 1986). In a different longitudinal study, smokeless tobacco users were more likely to report cigarette smoking at a two-year follow-up (67 percent) than were nonusers (14 percent) (Schinke et al. 1986). A study of undergraduates found that switching from smokeless tobacco to cigarettes was a more likely progression than the converse (Glover, Laflin, Edwards 1989).

Risk Taking and Rebelliousness

Although smoking is associated with rebelliousness and unconventionality, several studies have found no such association for smokeless tobacco use. A significant but modest relationship has been found between smokeless tobacco use and risk taking. In one of the few longitudinal studies of smokeless tobacco use, Dent et al. (1987) found that among eighth graders, current risk taking predicted the onset of smokeless tobacco use one year later. In another study, a significant relationship was reported between seventh-grade students' smokeless tobacco use and risk taking (Botvin, Baker, Tortu 1989). Studies with high school students found that risk taking was related to trying smokeless tobacco but not to the level of smokeless tobacco use (Riley, Barenie, Myers 1989; Riley et al. 1991). In two of eight replication samples in another study, risk taking was a significant correlate of trying smokeless tobacco (Sussman et al. 1989).

Participation in Athletics

Given the number of professional athletes who use smokeless tobacco, and given the associated advertising efforts by smokeless tobacco companies, youth who participate in athletics would seem likely to be at greater risk of using smokeless tobacco than nonparticipants. Current studies have mixed findings about this possible relationship. Although 28 percent of predominantly white Little League baseball players (aged 12 or less, N = 1,141) in southeast Texas believed that more than half of professional baseball players use smokeless tobacco, this belief was not strongly associated with use of smokeless tobacco among these youth (Evans, Raines, Getz 1992). Similar findings on a stratified random sample of rural and urban youth in grades one, three, five, and seven were reported in North Carolina (Lisnerski et al. 1991). In a one-year longitudinal study of seventh graders, sports participation did not predict onset of smokeless tobacco use in two samples of males and in one of two samples of females (Sussman et al. 1989); for the other sample of seventh-grade females, the relationship was positive but modest. Sussman et al. (1990) reported that self-identified "dirts" (i.e., "heavy metal" music enthusiasts and marijuana users) and "skaters" (i.e., skateboarders and surfers) were more likely to be currently using smokeless tobacco than were "jocks/athletes." Another study of high school students yielded inconclusive results (Riley, Barenie, Myers 1989). On the other hand, Ringwalt (1989) found that 11th- and 12th-grade athletes (students who played on school teams) were more likely than nonathletes to have used smokeless tobacco, to have used smokeless tobacco in the preceding 30 days, and to perceive fewer (if any) health risks for smokeless tobacco use. Jones and Moberg (1988) found that frequency of smokeless tobacco use was related to participation in team sports. Glover et al. (1989) found that smokeless tobacco use among U.S. college students was related to participation in organized sports. Taken together, the current evidence is inconclusive and warrants further investigation that might consider team rules regarding smokeless tobacco use, coaches' use of smokeless tobacco or attitude toward team members' use, and parents' degree of involvement in the team.

Personal Factors in the Initiation of Smokeless Tobacco Use

Knowledge of Long-Term Health Consequences

Because the long-term health consequences of smokeless tobacco use have not been as widely communicated as those of smoking, knowledge of these consequences is potentially an important predictive factor for smokeless tobacco use. Most youth appear to be aware that smokeless tobacco use can be harmful to health, but most smokeless tobacco users do not perceive their own risk to be great. In interviews with smokeless tobacco users, 80 percent of junior high school and 92 percent of senior high school users acknowledged that smokeless tobacco use can be harmful, but about 60 percent of the junior high users and 40 percent of the senior high users believed that there was no risk or only slight risk in regular smokeless tobacco use (USDHHS 1986). A study of 7th- through 10th-graders found that 31 percent of daily users of smokeless tobacco believed that there was very little health risk associated with this use (Ary, Lichtenstein, Severson 1987). Similarly, only 40 percent of 7th- through 12th-grade students in another sample perceived smokeless tobacco use as very harmful (Schaefer et al. 1985). Marty, McDermott, and Williams (1986) reported that 35 percent of high school students who use smokeless tobacco believed that such use had little or no effect on their health.

Many youth appear to believe that smokeless tobacco use is much safer than cigarette use. Schaefer et al. (1985) found that 77 percent of smokeless tobacco users perceived smoking to be very harmful, whereas only 40 percent perceived smokeless tobacco use as very harmful. Another study reported that 86 percent of fifth- and sixth-grade smokeless tobacco users believed that smoking would hurt their health, but only 33 percent believed this of smokeless tobacco use (Schinke et al. 1986). Ary et al. (1989) found that when smokeless tobacco users were asked why they preferred smokeless tobacco to cigarettes, they most often gave "lower health risk" as the reason. Users of smokeless tobacco are more likely than nonusers to perceive that smokeless tobacco is a comparatively safe alternative to cigarette use (Chassin et al. 1985; McDermott and Marty 1986; Boyle 1989; Glover, Laflin, Edwards 1989; Brownson, DiLorenzo, Van Tuinen 1990; Brownson et al. 1990; Lisnerski et al. 1991).

A number of studies have examined the relationship between concurrent smokeless tobacco use and health knowledge and beliefs about smokeless tobacco, but none of these studies have examined the prospective relationship. Most of these studies show that youth with more health knowledge of, or greater beliefs in, the risks of smokeless tobacco use are indeed less likely to use smokeless tobacco. Three studies reported that having tried smokeless tobacco was related to lack of health knowledge and beliefs (Cohen et al. 1987; Riley, Barenie, Myers 1989; Riley et al. 1991); only one study that examined this possible link failed to find such a relationship, and that study involved very young subjects (first through seventh graders) (Lisnerski et al. 1991). Multiple studies have reported that health knowledge and beliefs were significantly related to various categories of smokeless tobacco use (Boyle 1989; Polcyn et al. 1991), current smokeless tobacco use (Chassin et al. 1985; Colborn, Cummings, Michalek 1989; Glover, Laflin, Edwards 1989; Marty, McDermott, Williams 1986), level or amount of smokeless tobacco use (Riley, Barenie, Myers 1989; Riley et al. 1991), or daily smokeless tobacco use (Ary, Lichtenstein, Severson 1987). In only two studies was no relationship found between health knowledge and beliefs and smokeless tobacco use (Brownson et al. 1990; Lisnerski et al. 1991).

Functional Meanings

In a study of seventh- and eighth-grade students, favorable personal attitudes toward smokeless tobacco use were significantly related to concurrent use of smokeless tobacco (Polcyn et al. 1991). In another study, 8th- through 11th-grade students' expectancy and beliefs about the positive attributes of smokeless tobacco use (e.g., tastes good, is relaxing, helps concentration) were related to current smokeless tobacco use (Colborn, Cummings, Michalek 1989). Negative attributes of smokeless tobacco use (i.e., gives bad breath, stains teeth) were negatively related to current smokeless tobacco use (Colborn, Cummings, Michalek 1989). No prospective studies were found.

Social Image

Other research suggests that smokeless tobacco use has a more positive social image than smoking (Chassin et al. 1985; Chassin and Presson 1988). One study of high school students found that students were more likely to have used smokeless tobacco during the past month and that nonusers were more likely to have intentions of using if the students' real and ideal self-concepts were similar to their perceived image of smokeless tobacco users (Chassin et al. 1985). This finding suggests that youth may take up smokeless tobacco as a method of attaining a valued social image. Positive social attributes expected from smokeless tobacco use (e.g., increases attractiveness, brings more friends, makes one become more "macho") were also shown to be significantly related to concurrent use of smokeless tobacco (Colborn, Cummings, Michalek 1989). No prospective research was found.

Personality Traits

Some studies have examined relationships between smokeless tobacco use and a number of personality traits. A positive association was found with anger (Jacobs et al. 1988), anxiety (Jacobs et al. 1988), assertiveness (Botvin, Baker, Tortu 1989), depression (Jones and Moberg 1988; Rouse 1989), and locus of control (Dignan et al. 1986). A negative association was found with anxiety, curiosity (Jacobs et al. 1988), and self-concept (Dignan et al. 1985).

Smokeless Tobacco Use as a Risk Factor for Continued Use

Intentions to Use Smokeless Tobacco

Consistent with data on youth smoking, the research indicates a strong relationship between concurrent smokeless tobacco use and intention to use in the future. Brubaker and Loftin (1987) found that reported intention to use smokeless tobacco in the week after the survey was strongly related to current smokeless tobacco use in a small sample of fifth- through eighth-grade males. Intention to use in the next two weeks was also related to current-use status (Gerber, Newman, Martin 1988). No studies were found, however, that examined the prospective relationship between intention to use smokeless tobacco and the initiation or continuation of use.

Current Use of Smokeless Tobacco

Ary, Lichtenstein, and Severson (1987) prospectively examined the predictors of frequency of smokeless tobacco use at a nine-month follow-up for their sample of daily users of smokeless tobacco. Current use of smokeless tobacco was the best predictor of later use; the initial rate of use was highly correlated with the rate of use nine months later and accounted for 33 percent of the variance. This finding suggests that the successful reduction of smokeless tobacco use will require early intervention before the development of physiological addiction.

Summary of Psychosocial Risk Factors for Smokeless Tobacco Use

The major factors associated with the initiation and development of smokeless tobacco use found in this review are shown in Table 1. With the exception of adequate knowledge of the health consequences of smokeless tobacco use and the social acceptance afforded by smokeless tobacco use, these factors are nearly identical to those found for the onset of smoking. Although most youth perceive that smokeless tobacco use can be harmful to health, most smokeless tobacco users do not perceive the risk to be great, particularly to themselves, and particularly compared with the health risk of cigarette smoking. Peer modeling of smokeless tobacco use seems to be strongly and consistently related to the onset and continued use of smokeless tobacco. Smokeless tobacco use serves social functions within the peer group that may support experimental and continued use. The evidence is less conclusive for modeling by parents and siblings. Peer and, notably, parental acceptance of smokeless tobacco use is much higher than for cigarette smoking.

Fairly consistent evidence indicates that smokeless tobacco use is related to concurrent use of cigarettes, alcohol, and marijuana. Findings from prospective studies suggest that the use of smokeless tobacco may precede the use of these other substances and occurs early in a sequence of drug use by some adolescents. Prospective evidence shows that smoking and the use of alcohol and marijuana are also related to the onset and continued use of smokeless tobacco. Engaging in risk-taking behavior and having poor academic performance also appear to be related to smokeless tobacco use (see "Smokeless Tobacco Use and Other Health-Related Behaviors" and "Sociodemographic Risk Factors for Smokeless Tobacco Use" in Chapter 3). There is mixed evidence that smokeless tobacco use is associated with youthful athletic participation; nonetheless, some professional athletes have promoted its use both indirectly (through visible personal use) and directly (through advertising).

Finally, there is evidence of concurrent relationships (but no prospective evidence) between smokeless tobacco use and health beliefs/knowledge, attitudes, expectancies, and social image. The perception that smokeless tobacco use may be a healthier choice than cigarette smoking consistently emerges in the data and indicates the need for prevention programs that stress the health consequences of smokeless tobacco use.

Smokeless tobacco use, then, appears to be a function of the social world of young people, who see this "adult" behavior as an aid—a generally accessible one—in improving their individual social image. Moreover, perhaps because even among adults the health consequences of smokeless tobacco use are not widely understood, adults lack consensus on whether smokeless tobacco use should be actively discouraged. Peer use of smokeless tobacco thus becomes a strong motivator for initiation and continued use.

These misperceptions on the part of adolescents and adults alike are of serious concern, given the health-compromising, addictive aspects of smokeless tobacco use. More strikingly, smokeless tobacco use is associated strongly with other drug use and may serve as an entry behavior to the use of cigarettes, alcohol, and illegal substances.

Implications of Research for Preventing Tobacco Use: Modifying Psychosocial Risk

Although substantial research has examined the onset of tobacco use for individual adolescents, there is clearly a need to examine how change in community and cultural factors may modify onset rates. This review of the literature strongly suggests that the onset of tobacco use is socially learned and is a social behavior for adolescents, with socially relevant meanings, images, and functions. Therefore, rather than focusing only on individuals and families as the primary targets of prevention efforts, attention should also be directed to the social environment of adolescents. These efforts should consistently and persuasively promote the prevention and cessation of tobacco use and should demonstrate that the meanings of tobacco use are negative. Prevention efforts should portray tobacco use as a behavior that is nonnormative, unattractive, addictive, and immature.

Although the meanings of tobacco use are learned in childhood, early to middle adolescence appears to be the time of greatest need for direct intervention. This idea is not only supported epidemiologically by the occurrence of highest onset rates during this time, but also developmentally, in that the challenges of adolescence can expose youth to the perceived utility of tobacco use. The meanings of tobacco use that have been established in our society become personally relevant during adolescence. Tobacco use becomes a mechanism to establish social relationships, display independence, and create a new, mature identity. Moreover, because many adolescents believe themselves to be all but invulnerable, have a short perspective on their future, have limited abstract cognitive abilities, and highly value their associations with same-age peers, adolescents may view tobacco use as particularly functional to them and not potentially harmful. Adolescence is clearly a vulnerable time when adult involvement and protection is still warranted and required. Adults should see the prevention of adolescent tobacco use as an important part of their responsibility in the healthful socialization of the young.

The onset of tobacco use is strongly associated with peer influences, peer smoking, and peer approval of smoking. Programs that prevent tobacco use should systematically seek peer-group involvement and enlist peer role models who do not use tobacco. The emphasis of this involvement should be to affect peer-related norms and to persuade adolescents that most people their age do not use tobacco, that tobacco use has negative social consequences, and that tobacco use projects an image that, instead of being "cool," is unattractive, unpopular, and immature. Parents should also pay attention to the amount of time adolescents spend with peers, to peers' behavior, and to unsupervised peer-group activities.

The increased need for social competencies during adolescence (i.e., the ability of young people to decipher, cope with, and deal with the social environment) should be a critical focus of comprehensive efforts to prevent tobacco use. Adolescents need skills to help them identify, resist, and refute environmental influences—whether from the media, adults, or peers—to use tobacco. Similarly, adolescents may need to be taught how to cope better with difficult, stressful situations at home or at school. Without such skills, many youth may continue to use tobacco as a mechanism to deal with low self-esteem, depression, and the feelings of helplessness that can result from the ordinary challenges of growing up.

Positive social bonding with family and schools and health-enhancing behavior, such as physical activity, should be encouraged among youth as protective factors against tobacco use. Students who perform poorly in school should be offered tutoring and academic counseling; besides being personally motivating, such support can increase students' affiliation with school and decrease their involvement in tobacco use. Encouraging sports participation (and countering the negative role models of some professional athletes by providing explicit messages about the health consequences of smokeless tobacco use), regular physical activity, and a healthy diet may increase adolescents' valuation of, and attachment to, health and a healthy body that might be compromised by tobacco use. Parents may also need to demonstrate their support for academic achievement, health activities, and a greater link between home and school.

Finally, to substantially modify tobacco use and to provide adolescents with consistent messages against tobacco use, the community (and society on the whole) should embrace the prevention of tobacco use. A focus on individuals, families, or peer groups is necessary but not sufficient to address the origins of tobacco's appeal to young people. Limiting the acceptability of tobacco use through restrictive policies, such as legislation supporting clean indoor air and school policies banning tobacco use, provides a clear message to adolescents that tobacco use is not acceptable as a public behavior. Severely limiting adolescents' access to tobacco products makes it clear that cigarettes and smokeless products are dangerous substances. Mandating tobacco-use prevention programs in schools signals the importance of this topic through the use of explicit, earmarked resources. These community actions provide external support for parents, teachers, and adolescents to assert their beliefs about the health hazards of tobacco use and to assist their demand for tobacco-free environments. Such clear, normative messages emanating from the community level reinforce those messages given at school or at home. Above all, community action at multiple levels of the social environment directly and consistently refutes the notion that tobacco use is an attractive adult behavior. Community intervention should be a top priority in poorer communities, where the need for action is especially great.

Conclusions

1. The initiation and development of tobacco use among children and adolescents progresses in five stages: from forming attitudes and beliefs about tobacco, to trying, experimenting with, and regularly using tobacco, to being addicted. This process generally takes about three years.

2. Sociodemographic factors associated with the onset of tobacco use include being an adolescent from a family with low socioeconomic status.

3. Environmental risk factors for tobacco use include accessibility and availability of tobacco products, perceptions by adolescents that tobacco use is normative, peers' and siblings' use and approval of tobacco use, and lack of parental support and involvement as adolescents face the challenges of growing up.

4. Behavioral risk factors for tobacco use include low levels of academic achievement and school involvement, lack of skills required to resist influences to use tobacco, and experimentation with any tobacco product.

5. Personal risk factors for tobacco use include a lower self-image and lower self-esteem than peers, the belief that tobacco use is functional, and lack of self-efficacy in the ability to refuse offers to use tobacco. For smokeless tobacco use, insufficient knowledge of the health consequences is also a factor.

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Chapter 5
Tobacco Advertising and Promotional Activities

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The Role of Advertising and Promotion in the Marketing of Tobacco Products

Introduction

Businesses use advertising and promotion to influence the marketplace—to prepare a place for their product by signaling how it meets an existing or newly perceived need of the consumer. In the following discussion of such tactics for the tobacco-product marketplace, "advertising" refers to company-funded advertisements that appear in paid media (e.g., broadcasts, magazines, newspapers, outdoor advertising, and transit advertising), whereas "promotion" includes all company-supported nonmedia activity (e.g., direct-mail promotions, allowances, coupons, premiums, point-of-purchase displays, and entertainment sponsorships).

The general role of advertising is to communicate accurate information and to influence attitudes and beliefs (Kotler 1991). The information that advertising communicates can be either factual (e.g., product ingredients or features) or suggestive (e.g., images of types of people who might use a product, or associations of a product with a certain setting or emotion). Much of the regulatory activity for advertising is directed at factual communication; most of the criticism of advertising is directed at suggestive communication—at the images it creates and at the potentially misleading implications of user benefits that can be drawn from those images (Kotler and Armstrong 1991).

Advertising can be used to create primary demand—that is, to bring new users of a product category into the marketplace (Ray 1982). These users are attracted by advertising that demonstrates how a particular product can satisfy a customer need, either physical or psychological, that is currently either unmet or unsatisfied. Users also can be brought into a product marketplace by advertising that causes them to feel a previously unacknowledged need for a particular product. Primary demand can be increased through generic category advertising (such as trade association advertising for commodities like milk or beef). The advertising of a specific brand can sometimes both promote that brand and increase demand for an overall product category; for example, advertising for a particular computer can promote computers in general for first-time buyers.

Advertising also can be used to create selective (or secondary) demand—that is, to convince consumers to switch from one specific brand of product to another (McCarthy and Perreault 1984). Creating selective demand calls for advertising that demonstrates a brand's superior performance, price, or value. Alternatively, advertising can create selective demand by projecting that a brand has a more desirable image than its competitors (such as Avis Rent A Car's well-known slogan, "We're number two . . . but we try harder").

Consumers overestimate the effect of advertising on overall market factors, but underestimate its effect on them personally (Bauer and Greyser 1968). Thus, consumers may criticize advertising as being dishonest and manipulative, but they are unlikely to be able to provide examples of purchases they have made because of what they would consider advertising dishonesty or manipulation. In fact, they are unlikely to be able to identify any purchases they have made because of advertising. For most products, the role of advertising is to create in the consumer a structure of attitudes and beliefs about a product that will facilitate its purchase when the consumer is stimulated by a behavioral prod (Ray 1982). That prod can come from the social environment (for example, from another consumer's recommending the product), from a retailer, or from a promotional incentive, such as a coupon or a free sample.

The actual purchase of a product or service in a marketplace thus is often achieved by marketers' use of a specific promotion (Popper 1986; Davis and Jason 1988). Such activities are used to build on consumers' attitudinal predispositions and lead consumers to act. Promotion, in fact, is the fastest-growing category of all product marketing activity (Kotler 1991). This growth is partly a response to the proliferation of advertising as well as to the limited direct effect that advertising has been found to have on people's actions. Over the past few decades, the superabundance of advertising messages has made it increasingly difficult for a given ad to rise above the clutter of competing messages both in its own product category and in the plethora of advertisements in general. This competition is particularly true for products with well-established images and reputations. Thus, profit return of even a successful advertising expenditure may eventually diminish. Accordingly, the best sales returns for most industries result from effective advertising and promotion working in concert.

Promotional activities can take many forms. Promotional expenditures can stimulate retailers to place and display products in ways that will maximize the opportunity for purchase (e.g., supplying retailers with point-of-purchase displays to locate products at checkout stands). Coupons reduce the price a consumer pays for products and thereby reduce the consumer's cost-sensitivity, which may be a substantial barrier to making a purchase (McCarthy and Perreault 1993). Premiums (e.g., including a cigarette lighter in the purchase price or even within the actual packaging of a box or carton of cigarettes) reduce cost-sensitivity by increasing (or appearing to increase) the value of a purchase. Free samples do away with cost-sensitivity altogether and actually give consumers an opportunity to try something new (Popper 1986; Davis and Jason 1988). Promotional devices such as these are more likely than advertising alone to lead consumers to purchase a product more than once—a pattern sought by all manufacturers.

Cigarette Advertising and Promotional Expenditures

In 1990, cigarette advertising and promotional expenditures grew to almost $4 billion (see Table 1), making cigarettes the second most promoted consumer products (after automobiles) in the United States. These expenditures occurred at a time when domestic sales of cigarettes and adult per-capita consumption were at relatively low levels although domestic revenues continued to increase (Table 2). Advertising and promotional expenditures account for 10 to 12 percent of the revenue generated by the tobacco industry in the United States. More than three quarters of these expenditures were for promotional activities, which had steadily increased to over $3 billion, while advertising expenditures for cigarettes dropped to $887 million (Federal Trade Commission [FTC] 1992). The decline in cigarette advertising came principally from reductions in print advertising (a 14 percent drop in magazine advertising and a 7 percent drop in newspaper advertising) to their lowest level (in constant 1990 dollars) since the ban on broadcast advertising came into effect in January 1971 and the tobacco industry focused advertising attention on print media.

In 1990, expenditures for outdoor advertising and transit posters for cigarettes were at an all-time high of $435 million (see Table 3). The largest category of cigarette promotion that year was that of coupon use and retail value-added promotions, which at $1.2 billion represented nearly 30 percent of all cigarette advertising and promotional expenditures. The cigarette companies spent just over $1 billion on promotional allowances, which included the money that cigarette companies paid to retailers for shelf space (slotting allowances), cooperative advertising allowances, and trade (wholesaler) allowances. Cigarette companies spent over $300 million on point-of-purchase materials in 1990. These expenditures for displays were roughly equivalent (within 10 percent) to cigarette company expenditures on magazine advertising. The substantial increases in retail-oriented expenditures reflect an aggressive cigarette marketplace in which companies vie for larger shares of decreasing numbers of cigarette smokers.

In 1990, the cigarette companies also expended over $125 million on public entertainment (including sponsorship of sporting events and concerts). Total advertising and promotional expenditures for cigarettes included over $108 million for sports and sporting events alone. The cigarette companies reported no expenditures in 1990 for endorsements or testimonials or for having their brand names or tobacco products appear in any motion picture or television shows (FTC 1992). In contrast, movies in the 1980s were sometimes used to promote specific brands of cigarettes and other products (Magnus 1985).

Cigarettes continue to be one of the most heavily advertised products in print media (Centers for Disease Control [CDC] 1990). In 1988, cigarettes ranked first among products advertised in outdoor media, second in magazines, and sixth in newspapers. When advertising expenditures for these three print media are combined, cigarettes were the second most heavily advertised product after passenger cars (CDC 1990). These expenditures for cigarette advertising represent a drop, however, from the total advertising expenditures in these media in 1985 and are consistent with the cigarette industry's shift in emphasis to promotional activities.

One of the indirect consequences of advertising and promotional spending is that the media, reluctant to jeopardize the income that accompanies cigarette advertising, are inhibited in their coverage of the health risks of smoking. Warner, Goldenhar, and McLaughlin (1992) examined 99 magazines published in the United States from 1959 through 1969 and from 1973 through 1986 to assess the probability that the number of articles a magazine published on the health consequences of smoking would reflect whether they carried cigarette advertisements and what proportion of their revenues were derived from cigarette advertisements. Magazines that did not carry cigarette advertisements were more than 40 percent more likely to cover the health consequences of smoking than were magazines that carried such advertising. For women's magazines, the likelihood increased to 230 percent; a 1 percent increase in the share of advertising revenue derived from cigarette advertisements was found to decrease by nearly 2 percent the probability of these magazines' carrying articles on the risks of smoking. Numerous other studies and reports on this aspect of cigarette advertising were discussed in the 1989 Surgeon General's report on smoking and health (U.S. Department of Health and Human Services [USDHHS] 1989) and reinforce the general conclusion that despite

Table 1. Domestic cigarette advertising and promotional expenditures, 1963–1990

Year	Total advertising* dollars (in millions)	Total promotional† dollars (in millions)	Total advertising and promotional dollars (in millions)	Advertising as percentage of total dollars
1963	228.9	13.2	249.5	91.7
1964	240.9	14.6	261.3	92.2
1965	242.3	14.7	263.0	92.1
1966	272.7	17.9	297.5	91.7
1967	285.6	20.3	311.9	91.6
1968	283.1	21.6	310.7	91.1
1969	283.6	13.4	305.9	92.7
1970	296.6	64.4	361.0	82.1
1971	220.4	27.0	251.6	87.6
1972	226.7	22.9	257.6	88.0
1973	220.9	15.2	247.5	89.3
1974	266.5	31.1	306.8	86.9
1975	330.8	160.4	491.3	67.3
1976	425.9	213.2	639.1	66.6
1977	505.8	273.6	779.5	64.9
1978	543.1	331.9	875.0	62.1
1979	682.8	400.6	1,083.4	63.0
1980	790.1	452.2	1,242.3	63.6
1981	899.3	648.3	1,547.7	58.1
1982	923.2	870.6	1,793.8	51.5
1983	910.8	990.0	1,900.8	47.9
1984	930.2	1,065.0	2,095.2	44.4
1985	932.0	1,544.4	2,476.4	37.6
1986	796.3	1,586.0	2,382.4	33.4
1987	719.2	1,861.3	2,580.5	27.9
1988	824.5	2,450.4	3,274.9	25.2
1989	868.3	2,748.7	3,617.0	24.0
1990	835.2	3,156.9	3,992.0	20.9

Source: Federal Trade Commission (1992).

*Includes print advertising in newspapers, magazines, billboards, and public transit and (until ban effective January 1, 1971) on television and radio.

†Includes promotional allowances, sampling distributions, specialty item distribution, public entertainment, direct mail, endorsements, testimonials, coupons, audio-visual, and retail value-added, point-of-sale advertising, except for 1963–1974 and 1971–1974; for 1963–1969 and 1971–1974, only direct mail expenditures are included ("others" category not included).

Table 2. Domestic cigarette sales and per capita consumption, 1963–1990

Year	Total number of cigarettes sold (in billions)	Cigarette consumption (per capita)	Cigarette sales revenue (in millions)	Total advertising and promotional dollars (in millions)
1963	516.5	4,286	NA*	249.5
1964	505.0	4,143	NA	261.3
1965	521.1	4,196	NA	263.0
1966	529.9	4,197	NA	297.5
1967	525.8	4,175	NA	311.9
1968	540.3	4,145	NA	310.7
1969	527.9	3,986	NA	305.9
1970	534.2	3,969	NA	361.0
1971	547.2	3,982	NA	251.6
1972	561.7	4,018	NA	257.6
1973	584.7	4,112	NA	247.5
1974	594.5	4,110	NA	306.8
1975	603.2	4,095	NA	491.3
1976	609.9	4,068	NA	639.1
1977	612.6	4,015	15,594	779.5
1978	615.3	3,965	16,856	875.0
1979	621.8	3,937	17,668	1,083.4
1980	628.2	3,858	19,035	1,242.3
1981	636.5	3,818	20,822	1,547.7
1982	632.5	3,733	22,093	1,793.8
1983	603.6	3,513	25,724	1,900.8
1984	608.4	3,497	27,370	2,095.2
1985	599.3	3,400	28,918	2,476.4
1986	586.4	3,288	30,293	2,382.4
1987	575.4	3,190	32,145	2,580.5
1988	560.7	3,073	33,042	3,274.9
1989	525.6	2,846	37,048	3,617.0
1990	523.7	2,829	39,616	3,992.1

Sources: Federal Trade Commission (1992); U.S. Department of Commerce (1992a, b).
*NA = Not available.

decades of awareness of the dangers of tobacco use, media managers are reluctant to turn away the revenue enjoyed from cigarette advertising (Kessler 1989; Tye 1990).

Smokeless Tobacco Advertising and Promotional Expenditures

In 1986, a report of the Advisory Committee to the Surgeon General concluded that use of smokeless tobacco represents a significant health risk, is not a safe substitute for cigarette smoking, can cause oral cancers, and can lead to nicotine addiction and dependence (USDHHS 1986). In the same year, Congress passed the Comprehensive Smokeless Tobacco Health Education Act (CSTHEA) of 1986 (Public Law 99-252). The act required that (1) the public be informed of any health dangers of smokeless tobacco use, (2) smokeless tobacco advertising and packaging include three rotated warning labels (except on outdoor billboards, which could bear any one of the three warning labels), and (3) smokeless tobacco advertising be restricted from radio and television. The CSTHEA also encouraged legislation to make age 18 the minimum age to purchase smokeless tobacco; by 1993, all 50 states and the District of Columbia had passed such legislation (CDC, Office on Smoking and Health, unpublished data).

The 1986 Advisory Committee Report to the Surgeon General and the 1986 CSTHEA were responses to increasing evidence both that smokeless tobacco use compromised health and that increasing numbers of Americans apparently perceived smokeless tobacco as a safe alternative to cigarette smoking; annual U.S. consumption of smokeless tobacco had increased substantially between 1972 and 1985 (USDHHS 1986). Although the amount (in pounds) of smokeless tobacco sold declined from 1985 through 1988, amounts increased during the following three years (Table 4). By 1991, annual consumption of smokeless tobacco products in the United States had returned to its 1985 level of over 120 million pounds (FTC 1993).

The increases in the use of smokeless tobacco from the 1970s to the mid-1980s can be attributed to more aggressive marketing by the smokeless tobacco industry, new smokeless tobacco products, the teaming of smokeless tobacco with well-known sports and entertainment personalities, the increased accessibility of smokeless tobacco products, and a growing market of young males (Christen 1980; Glover, Christen, Henderson 1981; USDHHS 1992a, b; see "Environmental Factors in the Initiation of Smokeless Tobacco Use" in Chapter 4). One of the primary aims of advertising and promotional activities during the past two decades was to attract people to try smokeless tobacco (Glover, Christen, Henderson 1981; Tye, Warner, Glantz 1987). The strategy was evidently a success. In 1970, men over the age of 55 (presumably longtime users) were the heaviest users of moist snuff; by 1985, the usage rate was two times higher among males aged 16 through 19 than among older men (USDHHS 1992b).

In 1991, the United States Tobacco Company, one of five major tobacco companies that produce smokeless tobacco products in the United States, produced 87 percent of the moist snuff consumed (USDHHS 1992b). The company's most popular products, Copenhagen and Skoal, were also the most popular among adolescent users. Advertisements for these products have stressed that smokeless tobacco is easy to use, that it is convenient "in places where you can't light up," and that "a pinch is all it takes." By providing explicit instructions for use (sometimes delivered by well-known professional athletes) and by suggesting that the product could be used without adult detection, smokeless tobacco advertisements have appeared to target male adolescents (Christen 1980; USDHHS 1992b).

Promotional activities for smokeless tobacco have gained increasing importance since the CSTHEA of 1986, in part because radio and television advertising were banned by the act. Advertising and promotional expenditures for smokeless tobacco decreased each year from 1985 through 1987, then increased yearly from 1988 through 1991, along with yearly smokeless tobacco sales figures (Table 4). Of these expenditures, public entertainment sponsorship was the largest single advertising and promotional spending category from 1986 through 1990; over $21 million was allocated in 1991 (FTC 1993). In 1991, expenditures to provide consumers with cents-off coupons and retail value-added promotions, such as buy-one-get-one-free offers or specialty advertising gifts given at points of sale, became the largest spending category (over $23 million allocated). Public entertainment sponsorship and specialty advertising gifts appear to particularly appeal to male adolescents, even if the smokeless tobacco industry does not explicitly target teens (USDHHS 1992b).

Of particular note is the use of product sampling of smokeless tobacco products. In 1978, the United States Tobacco Company ran advertisements in *Sports Illustrated* for free samples of fruit-flavored, low-nicotine snuff products for beginners (Tye, Warner, Glantz 1987); the samples were accompanied by instructions on how to use smokeless tobacco. Currently, the smokeless tobacco industry's voluntary code on sampling prohibits sampling to those under 18 years old (Davis and Jason 1988); this restriction nonetheless permits the marketing of smokeless tobacco on college campuses.

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Table 3. Domestic cigarette advertising and promotional expenditures,[*] 1986–1990

Expenditures	1986 (in thousands)	% of total	1987 (in thousands)	% of total
Newspapers	119,629	5.0	95,810	3.7
Magazines	340,160	14.3	317,748	12.3
Outdoor	301,822	12.7	269,778	10.5
Transit	34,725	1.5	35,822	1.4
Point-of-purchase	135,541	5.7	153,494	5.9
Promotional allowances	630,036	26.4	702,730	27.2
Sampling distribution	98,866	4.1	55,020	2.1
Speciality item distribution	210,128	8.8	391,351	15.2
Public entertainment	71,439	3.0	71,389	2.8
Direct mail	187,057	7.9	187,931	7.3
Endorsements and testimonials	384	--	376	--
Coupons and retail value-added	--	--	--	--
All others[†]	252,570	10.6	299,355	11.6
Total[‡]	2,382,357	100.0	2,580,504	100.0

Source: Federal Trade Commission (1992).
[*] In U.S. dollars.
[†] Expenditures for audiovisuals are included in the "all others" category to avoid disclosure of individual company data.
[‡] Because of rounding, sums of percentages may not equal 100.

A History of Cigarette Advertising to the Young

Ads Targeting Women

In the first quarter of the twentieth century, cigarette firms demonstrated their ability to target and develop specific market segments. In the 1920s, cigarette smokers were predominately males, but the industry recognized females as a large and potentially lucrative market segment open to development. Encouraging the growth of smoking among women was an explicit goal of industry leaders and the focus of both advertising and major public relations efforts. The American Tobacco Company hired advertising expert A. D. Lasker of Lord & Thomas to work on Lucky Strike advertising. Previously, Lasker had successfully handled the delicate problem of advertising sanitary products (i.e., the Kotex brand)

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1988 (in thousands)	% of total	1989 (in thousands)	% of total	1990 (in thousands)	% of total
105,783	3.2	76,993	2.1	71,174	1.8
355,055	10.8	380,393	10.5	328,143	8.2
319,293	9.7	358,583	9.9	375,627	9.4
44,379	1.4	52,294	1.4	60,249	1.5
222,289	6.8	241,809	6.7	303,855	7.6
879,703	26.9	999,843	27.6	1,021,427	25.6
74,511	2.3	57,771	1.6	100,893	2.5
190,003	5.8	262,432	7.3	307,037	7.7
88,072	2.7	92,120	2.5	125,094	3.1
42,545	1.3	45,498	1.3	51,875	1.3
781	--	--	--	--	--
874,127	26.7	959,965	26.5	1,183,798	29.6
78,366	2.4	89,290	2.5	62,917	1.6
3,274,853	100.0	3,616,993	100.0	3,992,008	100.0

to women. His cigarette campaign began in the 1920s with an advertising budget of $400,000, which grew to $19 million by 1931. This budget supported a print advertising campaign that featured women and associated cigarettes with the attribute of bodily slimness. The principal selling idea was that smoking was an aid to diet behavior and weight control—a notion explicitly communicated by the slogan, "Reach for a Lucky Instead of a Sweet" (Gunther 1960).

The American Tobacco Company viewed the prospect of reaching the potential female market as "opening a new gold mine right in our front yard" (Bernays 1965, p. 383). Through Edward Bernays, perhaps the nation's most famous public relations consultant, the American Tobacco Company hired A. A. Brill, a psychoanalyst who advised the company to promote cigarettes as "symbols of freedom" (Bernays 1965, p. 386). Bernays then organized women to smoke in public in the 1929 New York Easter Parade (Schudson 1984) and to carry placards identifying their cigarettes as "torches of liberty" (Bernays 1965, p. 197). Photos and articles were distributed to small-town newspapers across the nation (Schudson 1984). Bernays called this public relations activity "the engineering of consent" (Bernays 1965, p. 390).

Advertising for other firms and brands also increasingly featured women and aimed advertising at women. In 1926, the Chesterfield brand of Liggett & Myers displayed a young woman saying, "Blow Some My Way" (Howe 1984). This ad precipitated public

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Table 4. Smokeless tobacco sales and advertising expenditures, 1985–1991

	Sales		
Year	Total pounds sold	Revenues (U.S. $)	Advertising and promotion expenditures (U.S. $)
1985	121,449,115	730,618,970	80,068,229
1986	118,778,334	797,777,885	76,676,706
1987	116,540,281	852,717,347	67,777,044
1988	114,435,233	901,654,382	68,223,671
1989	116,437,890	981,637,304	81,200,611
1990	117,415,326	1,091,170,201	90,101,355
1991	120,110,686	1,237,961,670	104,004,042

Source: Federal Trade Commission (1993).

outrage at the attempt to encourage women to smoke, yet prompted the envy and emulation of many other cigarette marketers (Wood 1958). Later, various cigarette campaigns targeted and featured women, including Hollywood movie stars, winners of the Miss America beauty pageant, women in heroic World War II roles, mothers (for Mother's Day), and brides (Howe 1984; Ernster 1985). Some of these campaigns explicitly portrayed cigarette smoking as appropriate for the young. For example, a Lorillard campaign that showed a woman running on the beach encouraged viewers to "Light an Old Gold for young ideas."

Ads Targeting Young People

From the time of the earliest marketing campaigns, parents, educators, and policy makers worried about the exposure—intentional or not, it was inevitable—of young people to cigarette advertising. These concerns were not misplaced. For example, one variant of the American Tobacco Company's campaign for Lucky Strike in the 1920s depicted a young woman and a very young man "breaking the chains of the past" to reach for opportunity and an open pack of cigarettes (Anderson 1929). In 1929, a Senate proponent of amendments to the Pure Food and Drug Act declared, "Not since the days when the vendor of harmful nostrums was swept from our streets, has this country witnessed such an orgy of buncombe, quackery and downright falsehood and fraud as now marks the current campaign promoted by certain cigarette manufacturers to create a vast woman and child market" (Schudson 1984, pp. 194–5).

Such protests had little effect on the tobacco industry's marketing plans. Despite the increased overall number of smokers in the 1920s, 1930s, and 1940s, the industry considered it strategically important to continue efforts to recruit more young consumers. In 1950, for example, a tobacco industry trade journal reported the following industry perception: "A massive potential market still exists among women and young adults, cigarette industry leaders agreed, acknowledging that recruitment of these millions of prospective smokers comprises the major objective for the immediate future and on a long term basis as well" (*United States Tobacco Journal* [*USTJ*] 1950b, p. 1). And at a 1955 press conference announcing redesigned brand packaging, the president of the Philip Morris Companies made it clear that appealing to the young was a deliberate, strategic focus for the company: "We wanted a new, bright package that would appeal to a younger market" (*Tide* 1955, p. 31). The company's ad director was even more explicit: "Our ads are now aimed at young people and emphasize gentleness" (i.e., ease of smoking) (*Tide* 1955, p. 31). A few years later, Philip Morris launched a comic strip campaign featuring a "handsome, rough and ready" adventure hero, "Duke Handy." The comic strip was placed in the Sunday color comic sections of 40 newspapers in a national network. Behind this comic strip was a "heavy promotional campaign" that included "stories and ads in major newspapers on the schedule, Duke Handy campaign buttons, truck posters, newspaper display cards, newsboy competitions and supporting publicity and promotional activities" (*USTJ* 1958a, p. 7).

These youth-oriented marketing strategies prevailed even in the face of increasing reports from scientists warning of the health risks of smoking. In 1963, *Fortune* magazine observed that "several recent studies show that teenagers have not been much impressed by any anti-smoking campaigns" (*Fortune* 1963, p. 101). In one of the studies discussed in this *Fortune* article, Gilbert Research, a firm specializing in research on the habits and interests of young people, reported that estimates of smoking rates among adolescents aged 13 through 19 had increased from 25 percent in 1961 to 35 percent in 1963. That study also found that 44 percent of graduating seniors smoked. The *Fortune* article linked this reported increase to advertising: "Cigarette ads often portray and seem to be pitched directly at young people" (p. 120).

Promotion Through Radio and Television

Cigarette sellers were among the most enthusiastic pioneers in the use of radio network broadcasting for coast-to-coast advertising. By 1930, the American Tobacco Company, Brown & Williamson, Lorillard, and R.J. Reynolds were all buying network radio time (Dunlap 1931). The American Tobacco Company's Lucky Strike brand sponsored many radio comedies and musical shows, such as *The Jack Benny Show, The Kay Kayser Kollege of Musical Knowledge,* and the best-known and longest running of the popular music shows, *The Lucky Strike Hit Parade.* This radio show, which started in 1928 and ran into the 1950s on television, appealed to a young audience; it featured, for example, teen idol Frank Sinatra when he was launching his career (Cone 1969). So popular was this show in 1938 that when its producers introduced a sweepstakes promotion offering free cartons of "Luckies" for correctly guessing each week's three most popular tunes, the promotion drew nearly seven million entries per week (Hettinger and Neff 1938).

By the early 1930s, R.J. Reynolds was sponsoring radio programs that were popular with youth, such as the *Camel Pleasure Hour, The All Star Radio Revue,* and the enduring *Camel Caravan,* which featured the swing music of Benny Goodman (Tilley 1985). In 1938, the Chesterfield brand of Liggett & Myers signed Glenn Miller and the Andrew Sisters to replace Paul Whiteman (Marin 1980). Artie Shaw appeared for Lorillard's Old Gold cigarettes, and Tommy Dorsey appeared for Brown & Williamson's Kool and Raleigh brands (Lewine 1970). The heavily commercial nature of these shows is hard to imagine by today's standard. A single hour of the *Raleigh Review,* for example, contained 70 promotional references to Raleigh cigarettes (Fox 1984).

Market research studies guided the selection of musical shows and styles that appealed to young people of various ages. For example, the market research files of the J. Walter Thompson Company, then advertising Old Golds for Lorillard, included the following market research studies for 1941 and 1942: Survey of Sales at Colleges, Survey of Dealers in 32 Colleges, Remembrance Check on "Apple" Campaign Among College Students, Report by Crossley on New York City Youth Interests in Radio Programs, and Radio Preferences Among Teenage Boys and Girls (Pollay 1988).

The successful use of radio led the cigarette industry to pioneer in television advertising. By 1950, more than seven hours per week were being sponsored by cigarette sellers. An editorial in that year's *United States Tobacco Journal* pronounced cigarette companies "the dominant factor in television advertising sponsorship"—evidence of the companies' faith that "it is an historically demonstrated certainty that the more people subjected to intelligent advertising, the more people will buy the product advertised" (*USTJ* 1950a, p. 4). By the early 1960s, tobacco companies were spending the majority of their total promotional budget on television advertising (*Advertising Age* [*AA*] 1963m, n). Their trust in the efficacy of advertising in this medium led to record-setting promotional spending (*AA* 1963b, 1964f), corresponding sales growth (*AA* 1963k), and increased profits (*AA* 1963p; *USTJ* 1963c).

Promotion Through Schools

Promotional activities sometimes advanced into the nation's schools. In 1948, Liggett & Myers Tobacco Company provided high schools with free football programs; a scorecard at the center of the program was in effect a two-page advertisement for Chesterfield cigarettes. Public complaints apparently led to the cancellation of this particular campaign, despite the fact that cigarette advertisers had previously supplied such programs for football and other high school sports (*Tide* 1948). In 1953, plastic-coated book covers featuring school logos on the front and cigarette ads on the back were being used to promote Old Gold cigarettes to students in most of the country's 1,800 colleges and in more than a third of its 25,000 high schools (*AA* 1953b).

College students in particular held great marketing potential for the tobacco industry in the 1950s. As Philip Morris Public Relations Director James Bowling explained: "Research and experience proved that the consumer, at this age and experience level, is more susceptible to change, has far-reaching influence value, and is apt to retain brand habits for a longer period of time than the average consumer reached in the general market. Therefore, though the advertising cost per thousand in the college market is relatively high, the actual expenditure can be a great deal more efficient" (Gilbert 1957, p. 184).

In the 1950s, the American Tobacco Company targeted college students with its largest ever Lucky Strike campaign, which used college newspapers, campus radio stations, football programs, and extensive campus sampling and tie-in promotions (*AA* 1953a). A research firm specializing in young people reported that cigarette firms were spending about $5 million per year on college promotions in the 1950s. It noted that most of these college students had started smoking at earlier ages, and that "continual exposure to advertising to adults through the different media has its effects on young people" (Gilbert 1957, p. 183).

Promotional efforts targeting college students were estimated by the President of the Student Marketing Institute to have doubled in the five years leading up to 1962. During those years, promotional tactics for the 20 brands active on college campuses included free samples distributed by student "representatives" paid by specific tobacco companies. Brown & Williamson, for example, employed 17 salesmen on college campuses (Neuberger 1964). Philip Morris paid 166 campus representatives $50 a month to distribute free cigarettes. Philip Morris also ran a college contest offering record players in exchange for collected empty packages. In New York's Cortland State College, Alpha Delta Delta (a sorority for physical education teachers in training) won several prizes by collecting packages accounting for 1,520,000 cigarettes (Neuberger 1964). College students were awarded cars as prizes in contests run by the Liggett & Myers Tobacco Company (*USTJ* 1963a). Cigarettes ads accounted for an estimated 40 percent of the national advertising incomes of the 850 college newspapers in the National Advertising Service (Brecher et al. 1963).

Sponsorship of Sports

Sports sponsorships were another common means to promote specific brands. Professional sports teams were given financial support by tobacco companies. Liggett & Myers had long been associated with baseball, regularly sponsoring games and using athletes' testimonials (*AA* 1963s). In 1963, R.J. Reynolds sponsored eight different baseball teams, and the American Tobacco Company sponsored six more. Football was also used to reach large audiences and to associate cigarettes with athleticism. Phillip Morris, which used athletes' endorsements of its Marlboro brand primarily to appeal to blacks (Pollay, Lee, Carter-Whitney 1992), sponsored National Football League games on CBS (*AA* 1963l) and the league championship games on NBC (*AA* 1963s). Also in 1963, the American Tobacco Company used New York Giants star Frank Gifford in advertisements for Lucky Strikes (*AA* 1963g), Brown & Williamson sponsored football bowl games (*AA* 1963d), and Lorillard had signed to sponsor the Olympic Games of 1964 and was already broadcasting previews (*AA* 1963u).

Criticism of Advertising and Promotional Activities

During these early years of the 1960s, there were criticisms of these successful selling efforts of the cigarette advertisers, just as there are currently. The criticisms were a reaction to the continued increase in cigarette sales among teens despite the growing and still newsworthy concern among scientists that smoking caused cancer. Much of this criticism and concern, however, was muted in the public forum by the reluctance of the media to jeopardize its lucrative cigarette sponsorships (*AA* 1963a). On the other hand, some noncommercial media, like *Reader's Digest*, which does not accept income for advertising, questioned the propriety of media industry behavior. Such questions were also raised in the publication, *The Consumers Union Report on Smoking and the Public Interest* (*AA* 1963r; Brecher et al. 1963). The Surgeon General's first report on smoking and health was imminent at this time and was anticipated with widespread discussion of the legislative responses it might precipitate (*AA* 1963i; Cohen 1963). Much of this talk focused on the industry's sponsorship of sports, on its use of athletes' endorsements, and on advertising copy appealing to the young.

Tobacco companies' targeting of youth was debated both inside and outside the advertising community. From within, a leading trade magazine for the advertising industry, *Advertising Age* (*AA* 1963b), and a leading advertising industry executive, John Orr Young of Young & Rubicam (*AA* 1964a), saw effective marketing to the young as strategically important to maintaining the industry's size and fostering further growth. Other industry spokespersons judged that the use of athletes was problematic, not only because it implied a healthfulness that was unwarranted, but also because it was a means of focusing on the teenage market. One critic asserted that television commercials focused on teens "by means of allusions to athletic prowess, popularity, datability and sexual allure.... It is basically a narcotic dream with an inexcusable dosage of dishonesty" (*AA* 1963e, p. 12).

An editorial in *Advertising Age* counseled the industry to put less emphasis on youth and athletes in their ads (*AA* 1963h). The National Association of Broadcasters, working on the development of a self-regulatory process, declared that "tobacco advertising having an especial appeal to minors, expressed or implied, should be avoided" (*AA* 1963o, p. 85). At the same time, *Reader's Digest* (1963) condensed an article from *Changing Times* magazine that cited the American Tobacco Company, R.J. Reynolds, and Lorillard as companies whose advertising and promotional activities were aimed explicitly at young people. The article noted the on-campus efforts targeted at college students, the hiring of students to distribute cigarette samples, and the dominant presence of cigarette advertising in campus publications. "Nowhere in that bright wonderful world depicted in the ads," the article observed, "is there any hint to youngsters that cigaret[te]s might be harmful" (*Changing Times* 1962, p. 35). The National Congress of Parents and Teachers (also known as the National Parent Teacher

Association) coined the expression "smokewashing" to imply that children were being brainwashed by cigarette advertising (*AA* 1963q).

The campaign that drew the most specific criticism for its advertising copy was the American Tobacco Company's 1963 Lucky Strike slogan: "Luckies separate the men from the boys, but not from the girls" (*AA* 1963c). The television schedule stipulated use of all three networks and spot commercials on 500 stations in 90 markets (*USTJ* 1963b). A typical print ad showed a young man looking longingly at an accomplished, mature man (such as a race car driver) who was enjoying a cigarette while receiving recognition for a feat (such as a trophy for winning a race) and being admired by an attractive woman. The President of the National Association of Broadcasters called the campaign a "brazen, cynical flouting of the concern of millions of American parents about their children starting the smoking habit. . . . They well know that every boy wants to be regarded as a man" (*AA* 1963g, p. 1). *Advertising Age* joined in editorial condemnation of the campaign by stating: "It is a too-clever, too-cynical attempt. . . . This is advertising we can do without" (*AA* 1963t, p. 20).

In the face of this criticism, the six major firms in the industry dropped virtually all advertising in college media, football programs, magazines, and newspapers, all of which they had been supporting with up to $1 million annually (*AA* 1963b). This action left in place, however, other teen-targeting practices, such as R.J. Reynolds's expenditure of nearly $2.5 million (about half of its spot radio commitment) on teen radio stations during after-school hours, a practice the company claimed it discontinued in 1964 (*AA* 1964b). *Advertising Age* noted the political and public relations dilemma that cigarette firms faced, since the companies were interested "in picking up new business from new, young smokers" yet did not want "to be seen reaching to the young market" (*AA* 1963f, p. 108).

Industry executives met in the summer of 1963 to discuss restrictions on television advertising, using the Tobacco Institute as a framework to avoid collusion charges (*AA* 1963v). One of the Tobacco Institute's suggestions was that programs "whose content is directed particularly at youthful audiences should not be sponsored or used. Thus, good judgment in program content, rather than arbitrary restriction of sponsorship to certain hours of the listening or viewing day, should be the determining factor" (*AA* 1963j, p. 1). Although the Tobacco Institute took pains to note that it did not monitor or regulate the advertising of its members, the chief executives of all of the major firms, save Brown & Williamson, instantly endorsed the suggestions, indicating that they would display the necessary judgment and self-regulatory restraint.

The suggestions of the Tobacco Institute drew scorn from Senator Maureen Neuberger, a leading Congressional critic of tobacco-marketing practices. The Senator felt that the suggestions and the entire self-regulatory process would prove to be an "exercise in futility" that was "motivated by a desire to head off government regulation" (*AA* 1963j, p. 8). Senator Warren Magnuson complained about sponsorship (for the Kent brand of cigarettes) of *The Ed Sullivan Show* for the Beatles' American debut, which exposed millions of teens to cigarette advertising (*AA* 1965).

In 1964, the Federal Trade Commission (FTC) noted that both the messages and the media placement seemed destined to attract the young:

> Whether through design or otherwise, cigarette advertising is so placed that its audience is substantially and not merely incidentally or insignificantly, composed of nonadults. . . . Whether or not the cigarette industry has deliberately attempted to exploit the large and vulnerable youth market, its advertising, in emphatically reiterating the pleasures and attractions of smoking without disclosing the dangers to health, has exercised an undue influence over the large class of youthful, immature consumers or potential consumers of cigarettes (FTC 1964, pp. 110–2).

An analysis of the television schedule sponsored by cigarette firms in 1963 indicated that almost all firms bought air time during a large number of shows that had audiences consisting of 30 percent or more youth (i.e., persons under 21 years old). The sponsors, the shows sponsored, and the percentages of youthful audiences for the shows included the American Tobacco Company—*Combat* (45 percent), *The Jimmy Dean Show* (32 percent), *Monday Night Movie* (30 percent), *Saturday Night Movie* (30 percent), and *The Twilight Zone* (30 percent); Liggett & Myers —*The Outer Limits* (46 percent), *The Price Is Right* (32 percent); Lorillard—*The Joey Bishop Show* (44 percent), *Wide World of Sports* (38 percent), *Winter Olympics Preview* (35 percent), *The Dick Van Dyke Show* (33 percent); Philip Morris—*The Jackie Gleason Show* (38 percent), *The Red Skelton Show* (37 percent), *Route 66* (31 percent); and R.J. Reynolds —*Glynis* (44 percent), *McHale's Navy* (40 percent), *The Beverly Hillbillies* (38 percent), *77 Sunset Strip* (32 percent), and *Saturday Night at the Movies* (32 percent) (Pollay and Compton 1992).

Altogether, cigarette companies sponsored 55 shows for a total of 125 hours a week. On the assumption that the average half-hour television show involved two commercials, teenagers were exposed to more than 1,350 cigarette commercials during 1963, and younger children were exposed to over 845 commercials during that year. Analysis of the time slots most frequently bought found that they were significantly correlated with the proportion of teenagers each time slot afforded (Pollay and Compton 1992).

A similar analysis in the FTC's annual report to Congress about cigarette advertising counted 73 television programs sponsored by cigarette companies; these programs appeared collectively 296 times during January 1968 and contained 501 advertisements. Not counting other sponsor identifications, this schedule likely exposed the average teenage viewer to over 60 full-length cigarette commercials per month (FTC 1968).

Self-Regulatory Cigarette Advertising Codes

In 1965, the tobacco industry began creating self-regulatory cigarette advertising and promotional codes (U.S. Congress 1965). The standards related primarily to four areas: advertising appealing to the young, advertising containing health representations, the provision of samples, and the distribution of promotional items to the young. The code prohibited cigarette advertising in school and college publications, testimonials from athletes or other celebrities perceived to appeal to the young, the use of advertising through comic books or newspaper comics, and the distribution of samples at schools. Also prohibited were representations that smoking was essential to social success, representations that the healthiness of models was due to cigarette smoking, the use of models who were participating in physical activity, or the use of models who were younger (or appeared younger) than 25 years of age.

As one observer (Baker 1968) noted, the tobacco industry did not seem to find its code particularly restrictive:

> Four months after the code was formulated, Viceroy ads featured young tennis players lighting up after a hot game. Salem showed a young couple playing giggly games alongside a waterfall. . . . A TV commercial producer admitted that it didn't matter how young the models *looked*, or how youthful were their actions, as long as they possessed 'over twenty-five' birth certificates. In fact, his quest was for older models who 'looked young' (p. 116; italics in original).

The code also prohibited cigarette advertising on shows whose audience was "primarily" underage—that is, 45 percent or more of a show's viewers were under 21 years old (*AA* 1966). This decision rule allowed considerable room for interpretation. For example, R.J. Reynolds continued to sponsor *The Beverly Hillbillies* even though the audiences for two selected individual shows exceeded the code requirement; a later interpretation by the tobacco industry held that the code would be applied to two successive months of audience analyses, rather than to selected specific shows (*AA* 1967b). Later that year, after monthly data showed high levels of minors, R.J. Reynolds ceased sponsoring the show (*AA* 1967c).

The National Association of Broadcasters Code Authority, which reviewed all advertisements under the self-regulatory process, noted that the volume and character of cigarette advertising were likely to influence the young and were therefore still problematic. In a confidential report, the association expressed its concern:

> Despite changes which have been brought about in cigarette advertising on radio and television, the cumulative impression created by virtually all of the individual campaigns supports a finding that smoking is made to appear universally acceptable, attractive and desirable. . . . The difficulty in cigarette advertising is that commercials which have an impact upon an adult cannot be assumed to leave unaffected a young viewer, smoker or otherwise. The adult world depicted in cigarette advertising very often is a world to which the adolescent aspires. The cowboy and the steelworker are symbols of a mature masculinity toward which he strives. Popularity, romantic attachment and success are also particularly desirable achievements for the young. To the young, smoking indeed may seem to be an important step towards, and a help in growth from adolescence to, maturity (National Association of Broadcasters 1966, pp. 30–1).

Candy Cigarettes

In 1967, the FTC complained to the tobacco industry that the industry's self-regulatory code permitting the sale of candy and bubble gum in packages that resembled those of actual cigarette brands amounted to "an indirect form of advertising aimed at children" (*AA* 1967a, p. 191). At least five U.S. candy manufacturers distributed candy cigarettes that imitated existing cigarette brands. The brands imitated (some by more than one candy company) were Camel, Lucky Strike, L&M, Marlboro, Pall Mall, Salem, Winston, Chesterfield, Oasis, Lark, and Viceroy. One type of candy cigarette came from a European source and appeared in packages stating, "Made under license of Philip Morris Inc., New York, NY, USA." The domestic candy cigarettes bore no such overt evidence of links to the tobacco industry, but one U.S. candy maker interviewed in *Advertising Age* stated that "no [tobacco] company had ever suggested that it might take action" for unauthorized use of trademarks (*AA* 1967d, p. 97). Another said, "The companies don't object. That's the point. We've been doing it for many years. They don't care" (p. 97).

The tobacco companies disclaimed any intent to lure children with candy cigarettes, but would not say what action, if any, would be taken. Candy cigarettes imitating Camel, Lucky Strike, L&M, Marlboro, Pall Mall, Salem, Winston, and Viceroy were still available in the United States into the late 1970s (Blum 1980). Such candy has since become less widely available, but it has not been banned by law.

A recent study of the role candy cigarettes play in the development of smoking behaviors used focus groups, student surveys, and a distributional analysis to find that most children knew where to obtain candy cigarettes, even though they were available at only some convenience stores. The study also observed that repeated candy cigarette purchases were significantly correlated with experimental tobacco use, even when the analysis controlled for parents' smoking status (Klein et al. 1992).

Changes in the Style of Cigarette Advertising

Before reports in the early 1950s began linking cancer and smoking, cigarette advertising characteristically had used explicit health claims, assertions, and reassurances, such as "Not a Cough in a Carload," "No Throat Irritation," "More Doctors Smoke Camels Than Any Other Cigarette," "Smoking's More Fun When You're Not Worried by Throat Irritation or 'Smoker's Cough'" (Calfee 1985). With greater public concern about cancer, however, these continuing health claims, although intended to reassure consumers, were likely increasing consumer awareness of the suspected health risks of smoking. Ad slogans like Philip Morris's "The cigarette that takes the fear out of smoking" were thus judged by a *Business Week* article (1953b) to be "strange somersaults. . . . The company comes as close as is possible to the word 'cancer' without actually using it" (p. 54).

Similarly, an article in *Fortune* called industry attention to the fact that many campaigns were so "riddled with warnings and appeals to fear" that "the present cigarette turmoil could be considered an inside job. . . . [The] industry may be promoting itself toward a dead end" (*Fortune* 1953, p. 164). A *Business Week* article pointed out that the manufacturers' explicit health claims were exacerbating consumer concern. Although the industry could attribute its impressive growth to advertising, "the cigarette companies achieved much of this remarkable result by screaming at the top of their lungs about nicotine, cigarette hangovers, smoker's cough, mildness and kindred subjects. . . . From the early 1930s on, this meant almost solely one thing—sell health" (*Business Week* 1953a, pp. 66, 68). The leading trade journal for the tobacco industry, the *United States Tobacco Journal*, pointed out that the industry had been "warned editorially on many occasions that the 'health' theme was a risky one" and counseled selling "pleasure" instead of health (*USTJ* 1958b, p. 4).

Motivation Research and the Image Era

Market motivation researchers were likewise advising the industry to create positive images of cigarettes. The researchers pointed out that "the differences between the taste of different cigarette brands are much more imagined than real" (Dichter 1964, p. 345) and that "logic does not play a major role in marketing cigarettes" (Cheskin 1967, p. 135). Leo Burnett, the advertising expert who led the agency that repositioned the Marlboro campaign from a distinctly feminine to a distinctly masculine image, noted that "those who do smoke do so for various conscious or unconscious reasons" (Burnett 1958, p. 43).

Social Research Inc. did motivation research on the psychology of smokers (Day 1955) and concluded that "advertising makes cigarettes respectable, and is thus reassuring" (Neuberger 1964, p. 38). Young & Rubicam also did a series of deep motivational interviews of smokers to extract social meanings, conflicted feelings, attitudes, perceptions, and beliefs about health aspects (Smith 1954). The results showed the importance of the themes of freedom and escape to smokers. Motivation researchers concluded that people were "really interested in the properties from a psychological point of view. . . . Is it an exotic cigarette? . . . [Is it] masculine? . . . [Does it] alleviate my health worries?" (Martineau 1957, p. 61). They pointed out that health appeals may capture momentary competitive advantages, and they may offer some reassurance to the inveterate smoker. But they do nothing to widen the market, to tap the driving force of the real psychological satisfactions of smoking.

According to these researchers, "the psychological satisfactions are . . . the best material for advertising themes and appeals, because they carry their own reassurance. They are emotional supports which have developed in American society to make smoking seem reasonable, justifiable, and highly desirable. They obviously cannot be thrown in people's faces in their bare essence; but when they are implied, when they are communicated, they are understandable and satisfying" (Martineau 1957, p. 65).

Put simply, the recommendations were to use reassuring pictures, not words; images, not information. This tactic of employing visual imagery, lifestyle portrayals, and drama to create mood and attitude, rather than words, facts, and data to create knowledge and comprehension, is now known as "transformational" or "image" advertising, which stands in contrast with "informational" advertising (Puto and Wells 1983).

A leading text on advertising (Wells, Burnett, Moriarty 1989) uses the Marlboro repositioning campaign (discussed in detail later in this chapter) as the prototype example of this strategy. Martineau (1957) described a typical Marlboro ad and noted that "the significant meanings are coming from the illustration. The copy logic is strictly after-the-fact" (p. 19). He disputed the conventional wisdom that the illustrations are merely attention-getting devices: "This is nonsense. The other meanings [from the visuals] can be totally unrelated to copy logic—and far more important" (p. 19).

Consequences of Image Advertising

As an article in the trade journal *Printers' Ink* observed, the "grim messages . . . from the health-scare days [of the early 1950s] gave way to pleasant, almost 'Pollyanna' prose. . . . The 1955 comeback . . . [taught advertising to] stick to cajoling the smoker with soft, 'gentle' phrases and oh-so-gay jingles" (Day 1955, p. 15). A few years later, the same journal noted that "once more the industry is back to its traditional and usually successful course — advertising flavor, taste and pleasure against a backdrop of beaches, ski slopes and languid lakes. It is a formula that works, as all-time high sales show" (*Printers' Ink* 1960, p. 37). As *Fortune* (1963) summarized, "Nowadays, all allusions to the health question are models of indirection" (p. 125).

In 1981, the FTC reviewed the changes that had occurred in cigarette advertising since the 1964 Surgeon General's report and noted the continuing glamorization of cigarette smoking. The FTC noted that in the last sixteen years:

> There has been little change. . . . Ads have continued to attempt to allay anxieties about the hazards of smoking and to associate smoking with good health, youthful vigor, social and professional success . . . Thus, the cigarette is portrayed as an integral part of youth, happiness, attractiveness, personal success and an active, vigorous, strenuous lifestyle. . . . [The ads are] rich in thematic imagery associating smoking with, among other things, outdoor activities, athletics, individualism and achievement. They are frequently filled with rugged, vigorous, attractive, healthy-looking people living energetic lives full of success and athletic achievement, free from any health hazards" (FTC 1981, pp. 2–2, 2–8).

Conveying Male and Female Images

One of the early consequences of motivation research was to help the industry give brands of cigarettes distinctly male or female identities (Burnett 1958; Cheskin 1967). Probably no brand more dramatically demonstrated this strategy than Marlboro, which in 1956 was converted, through an enormously successful advertising campaign, from a previous, stereotypically "female" advertising image to a stereotypically "male" image that culminated in the Marlboro cowboy. (The particulars of this marketing transformation are discussed later in this chapter.) Leo Burnett (1961), the man who created the Marlboro cowboy, described how the campaign touched a motivational chord in consumers: "We have been able to get under [the consumers'] skins a bit and find out what they really think about a product or the presentation of it and can't or won't express in words" (p. 63). Research for the campaign was done, in part, by the Home Testing Institute and the Color Research Institute for association testing (Cheskin 1967). Intensive field interviews were used to pretest the selling promotion and advertising techniques (Weissman 1955).

Large advertising spending in all media brought the campaign to a vast audience. Leo Burnett (1961) described outdoor advertising as a vital factor in the success of Marlboro; the medium's low cost per exposure allowed for the use of enough signs to achieve what Burnett called "the No. 1 factor in building confidence . . . the plain old fashioned matter of *friendly familiarity*" (p. 217; italics in original). This success with advertising the Marlboro brand led Philip Morris to launch another brand, Virginia Slims, with stereotyped female characteristics (Weinstein 1970). The success and durability of both these campaigns evidence the power of nonverbal imagery to communicate subjective values such as independence, masculinity, and femininity and to attract and retain consumers.

Historical Perspectives on the Effectiveness of Cigarette Advertising

The role of cigarette advertising in attracting new smokers was easier to recognize in the days when the rate of recruitment exceeded the rate of death and quitting so that total cigarette sales grew. Comments from diverse sources credited cigarette advertising for expanding sales and accelerating market-broadening social trends, such as smoking among women. This acknowledgment of cigarette advertising's effects on demand and onset was commented on in articles by academic analysts, advertising agents and journals, the tobacco trade press, and tobacco executives themselves.

Academic and Industry Analyses

"In the 1920s," a recent analyst noted, "advertising sold the cigarette habit to the American Public—surely the industry's most regrettable achievement of the decade" (Fox 1984, p. 114). Commenting during the 1940s on the diminution of the medical, moral, and religious reservations about smoking previously held by consumers, a Harvard Business School professor wrote, "The campaigns of testimonials featuring well-known personages and the picturing of the 'right' kind of people smoking have undoubtedly had an influence in breaking down such prejudices. . . . Advertising undoubtedly has played a part in speeding up social acceptance of women's smoking" (Borden 1942, pp. 223, 227).

One analyst who annually evaluated the cigarette industry noted that the industry is a "glowing testimonial to the power of advertising. . . . These particular companies have not only out-spent but also have out-earned any other[s] . . . . [T]he tobacco tycoons . . . are loudest in their praise for the part that advertising has played." (Wootten 1941, p. 5). *Business Week* (1953a) commented that "cigarettes offer the classic case . . . of how a mass-production industry is built on advertising" (p. 66).

Advertising Professionals

Printers' Ink, the leading advertising trade journal of its day, noted in 1930 that sales success already demonstrated "the one feature which has contributed more than any other single factor to the enormous growth of the cigarette industry—advertising" (Tennant 1971, p. 137). This opinion was upheld by the sales performance of cigarettes during the Great Depression: "The growth of cigarette consumption has, itself, been due largely to heavy advertising expenditure. . . . It would be hard to find an industry that better illustrates the economic value of advertising in increasing consumption of a commodity. . . . There can be no doubt but that steady advertising pressure has been a dominating force in increasing cigarette consumption among both men and women" (Weld 1937, pp. 70–2).

John Orr Young's agency, Young & Rubicam, who had previously done work for the tobacco industry, observed in 1964 that cigarette makers had continued to use "attractive boys and girls" to serve as "decoys in cigarette advertisements. Advertising agencies are retained by cigarette manufacturers to create demand for cigarettes among both adults and eager youngsters. The earlier the teenage boy or girl gets the habit, the bigger the national sales volume" (*AA* 1964c, p. 3). Another leading advertising executive, the President of McManus, Johns & Adams, stated, "There is no doubt that all forms of advertising played a part in popularizing the cigarette" (*AA* 1964e, p. 107).

One of the agency executives who had worked on the Marlboro account with Leo Burnett later wrote: "I don't think cigarettes ought to be advertised. . . . [W]hen all the garbage is stripped away, successful cigarette advertising involves showing the kind of people most people would like to be, doing the things most people would like to do, and smoking up a storm. I don't know any way of doing this that doesn't tempt young people to smoke, and, in view of my present knowledge, this is something I prefer not to do" (Daniels 1974, p. 245).

More recently, the late Emerson Foote, a founder of Foote, Cone and Belding and more recently a member of McCann–Erikson, ridiculed the industry claims that its advertising only affects brand switching and has no effect whatsoever on recruitment: "I don't think anyone really believes this. . . . I suspect that creating a positive climate of social acceptability for smoking, which encourages new smokers to join the market, is of greater importance to the industry. . . . In recent years, the cigarette industry has been artfully maintaining that cigarette advertising has nothing to do with total sales. Take my word for it, this is complete and utter nonsense" (Foote 1981, pp. 1667–8).

Because of their conviction that cigarette advertising played a role in recruiting the young, many advertising professionals refused to work with the cigarette companies. Just before the first Surgeon General's report was published in 1964, *Advertising Age* (1963i) stated emphatically, "It seems safe enough to say that no advertiser, no agency man, and no media man would want to continue advertising cigaret[te]s if it were clear that they pose a serious and positive danger to the health of the ordinary smoker . . . . [L]et's not have any more sidestepping" (p. 22). When the Surgeon General's report was issued, several advertising industry leaders publicly avowed that their ad agencies would cease or refuse cigarette advertising accounts on moral grounds—a position that clearly acknowledged advertising's role in building and sustaining demand. Those who refused included several who were highly visible and prominent—Bill Bernbach of Doyle, Dane, Bernbach (*AA* 1964b); David Ogilvy of Ogilvy and Mather (*AA* 1964d); Nelson Foote of Foote, Cone and Belding (O'Gara 1964); and John Orr Young of Young & Rubicam (*AA* 1964a).

The *United States Tobacco Journal*

The *United States Tobacco Journal*'s frequent and unabashed comments on the power of advertising became something of an editorial litany during the 1950s and early 1960s. In 1953 the journal observed that "advertising, in the hands of manufacturers of tobacco products, has become a powerful tool for the construction of the massive edifice of this industry" (*USTJ* 1953, p. 4). After the industry rebounded from the reports during the early 1950s of a tobacco–cancer link, the journal stated, "There is no obstacle to large-scale sales of tobacco products that cannot be surmounted by aggressive selling" (*USTJ* 1955a, p. 4) and elsewhere noted "the pivotal importance of advertising" (*USTJ* 1955b, p. 4). A year later, the journal could claim that "the effectiveness of current advertising by tobacco products manufacturers has been demonstrated repeatedly by the upward trend in sales volume that results there from" (*USTJ* 1956, p. 4).

In 1959, the journal anticipated the launch of multiple new brands and the associated intense advertising drives to "increase sharply the trend toward greater volume in the whole tobacco industry" (*USTJ* 1959, p. 3). "The purpose of advertising . . . has a simple answer: to sell goods," the journal declared in 1960 (*USTJ* 1960a, p. 4), later pointing out that "steady increases in sales of cigarettes offer the classic example of what advertising can do . . . advertising pays off" (*USTJ* 1960b, p. 4). By 1963, the ever-increasing spending on cigarette advertising and promotion led the journal to declare: "The money invested by the tobacco industry in various forms of advertising and promotion essentially reflects the industry's faith in the effectiveness of advertising as a vital sales-building tool. This faith appears justified by the continued annual rise in sales of cigarettes in this country" (*USTJ* 1963c, p. 4). These observations from the tobacco industry's chief trade journal testify to the industry's view of advertising as an increasingly necessary and proven means of selling cigarettes. From a perspective two decades after the 1964 Surgeon General's report, the official history of the R.J. Reynolds Company comments that "the company's advertising expenditures and those of its major rivals were extraordinary, reflecting the apparent agreement on the necessity of large-scale advertising to fuel expansion" (Tilley 1985, p. 330). The view was shared throughout the industry, which embraced increasingly sophisticated advertising strategies in an almost concerted effort. George Washington Hill, proud of his role in building the modern tobacco industry, said, "The impetus of those great advertising campaigns not only built this for ourselves, but built the cigarette business as well, because . . . you help the whole industry if you do a good job" (Tennant 1971, p. 137).

The "Maturity" of the Cigarette Market

As a spokesperson for the cigarette industry has argued in a congressional hearing (Ward 1989), the industry considers itself to be operating in a "mature" market—mature because the growth in this market has slowed over the past two decades and because the product being marketed is well known to consumers. This theoretical concept of a mature market is drawn from the "product life cycle," an analogy to the stages of biological development from birth to death. The application of this theory to the cigarette industry hinges on the belief that markets develop in predictable stages and that these stages govern the intent of corporate behaviors, such as advertising and promotion. It has been asserted before congressional hearings, for example, that "in 'mature' markets such as the one for tobacco products, awareness of the product is universal. The function of advertising in a 'mature' market is to promote brand loyalty or brand switching" (Ward 1989, p. 304). The argument continues that the tobacco industry has no strategic interest in youthful nonsmokers because "advertising cannot influence a nonuser to begin using the product category" (Ward 1989, p. 306).

Few studies have specifically examined how the product life cycle applies to the cigarette industry. One early study written in support of the concept defined three substages of market maturity. Of 33 cigarette brands examined, only 36 percent of them were classified into any of the three mature stages, in contrast with 56 percent of health care and personal care products and 60 percent of food products (Polli and Cook 1969). A few years later, two research directors from the J. Walter Thompson advertising agency reviewed this study and others and counseled readers of the *Harvard Business Review*: "Most writers present the [product life cycle] concept in qualitative terms, in the form of idealization without empirical backing. Also, they fail to draw a clear distinction between product class (e.g., cigarettes), product form (e.g., filter cigarettes), and brand (e.g., Winston). But, for our purposes, this does not matter. We shall see that it is not possible to validate the model at any of these levels of aggregation" (Dhalla and Yuspeh 1976, p. 103).

Advertising textbooks counsel that even when faced with so-called mature markets, advertising firms can and often should attempt both to increase usage among existing customers and to address potential new users. For example, one leading textbook makes it clear that product maturity by no means rules out the capacity—or the need—to attract new users:

> Product class maturity is typified by a slowdown of growth and a fairly constant level of sales. This means that competition may become very intense because any brand can only increase its sales by taking them from a competitor or by developing new uses, users, or changing the product. . . . The brand's objectives during maturity are to defend its position, take share from the competition, promote new uses and users, and support the retailer. . . . In addition, the advertising should stress new uses, new users, and new usage occasions in an attempt to increase overall sales of the product class (Rothschild 1987, p. 105).

It appears that no matter what the appropriate classification of the product, different classes of potential consumers will still exist as market segments with different and particular circumstances. Marketing will thus have to address these individual segments—including that of young people for whom the product and brands are less well known, and for whom appeal must be created, since cigarettes are not a necessity of life.

Perhaps the strongest indicator that cigarette manufacturers, despite their assertions about encouraging brand switching and fostering brand loyalty, must seek out large numbers of new consumers stems from a striking feature of this mature market. The noted "slowdown" over the past two decades reflects the substantial attrition that has occurred among the industry's consumers: since 1964, about 44 million Americans have quit smoking (CDC 1993), and approximately 9 million more have died of tobacco-related disease (Tye, Warner, Glantz 1987). For the cigarette industry to preserve its mature—that is, slowing in growth but not yet declining—U.S. market status, it must attract some two million new smokers each year to replace these lost consumers. To reach this market of potential new smokers, the industry must earmark a large proportion of the $4 billion annually spent on advertising and promotional activities. As is shown through epidemiologic data in Chapters 3 (see "Age or Grade When Smoking Begins") and 4 (see "Sociodemographic Factors in the Initiation of Smoking") of this report, these new smokers will primarily be adolescents. These potential young consumers have been shown to become aware of cigarettes, in part, through cigarette advertising (Chapman and Fitzgerald 1982; Aitken, Leathar, O'Hagan 1985); moreover, young people appear to develop brand loyalty early on (O'Connell et al. 1981), and because of the addictive properties of nicotine (discussed in Chapter 2), these young smokers are likely to continue into adulthood as cigarette consumers.

Contemporary Strategies of the Tobacco Industry

Tobacco companies have used multiple research resources and perspectives even for a single brand. Most of this research is not accessible. However, recent disclosures of corporate documents examined during a trial contesting Canada's cigarette advertising ban, which became effective on January 1, 1989, provide evidence that at least some tobacco companies (in this instance, both plaintiffs) have explicitly targeted youth as recently as the 1980s. These documents, which have been cited and discussed in Pollay and Lavack (1992), were disclosed in proceedings assessing the constitutionality of Canada's Tobacco Products Control Act (Imperial Tobacco Limited & R.J. Reynolds–MacDonald Inc. v. LeProcurer General du Canada, Quebec Superior Court, 1990). This litigation provided a unique opportunity to examine contemporary internal industry documents regarding the industry's strategic interest in youth.

Researching the Young

Documents produced during the Canadian trial revealed information about projects that support the interest of the tobacco industry in the youth market. Imperial Tobacco Limited's Project Huron, for example, evaluated the feasibility of a flavored cigarette targeted primarily at males aged 15 through 25 years old. The project was the subject of at least 33 different market research reports supplied by at least six external research sources over the space of just four years. Research documents discussed the behavior of 11-, 12-, and 13-year-olds and the nature of the process of beginning to smoke (Pollay and Lavack 1992). Both Imperial Tobacco Limited and R.J. Reynolds–MacDonald generated several research studies focused on beginning smokers; some of these studies identified the perceived risks and rationalizations of preteens and teens at smoking onset.

Imperial Tobacco Limited's Project 16 (AG–216)[1] revealed that "the adolescent seeks to display his new urge for independence with a symbol, and cigarettes are such a symbol. . . . Serious efforts to learn to smoke occur between ages 12 and 13 in most cases. . . . However intriguing smoking was at 11, 12 or 13, by the age of 16 or 17 many regretted their use of cigarettes for health reasons and because they feel unable to stop smoking when they want to" (p. i-vi). The follow-up Project Plus/Minus (AG–217) revealed to Imperial Tobacco Limited that "starters no longer disbelieve the dangers of smoking, but they almost universally assume these risks will not apply to themselves because they will not become addicted. Once addiction does take place, it becomes necessary for the smoker to make peace with the accepted hazards. This is done by a wide range of rationalizations. . . . The desire to quit seems to come earlier now than before, even prior to the end of high school" (p. vi).

The other plaintiff in the trial, R.J. Reynolds–MacDonald, had also researched the young, studying in great depth 1,022 subjects from ages 15 through 24 in Youth Target Study '87 (RJR–M–6). To determine whether young people who had never smoked came from particular family and social environments, the study considered the possible factors of adult smoking, family pressures about starting, and smoking by teenage peers. Personality and attitude were assessed through 15 character dimensions, such as "laissez-faire," "workaholic," "wimpishness," or "dropout." Attitudes and knowledge about the association between smoking and health risk were closely studied. The images of smokers, ex-smokers, and never smokers were measured along 17 dimensions. Data on the image of tobacco products were gathered on 25 scales. Advocacy issues were inferred by measuring awareness of antismoking campaigns and the relative credibility of various sources of information, such as doctors, teachers, government employees, and manufacturers. Perhaps the most striking component of this massive research effort, however, was the measurement of personality traits using a clinical psychometric instrument, Cattell's 16 Personality Factors. Scales of this instrument measure elements of personality defined as ranging from tough-minded to tender-minded, trusting to suspicious, or shy to adventuresome, among others.

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[1] To cite documents entered into evidence, this discussion uses the trial numbers indicating who entered the documents—e.g., Attorney General (AG–###) R.J. Reynolds, Inc. (RJR–M–###), or Imperial Tobacco Ltd. (ITL–###).

Youth Target Study '87 used cluster analysis to divide the youth market into seven psychographic groups: "Big City Independents," "Tomorrow's Leaders," "Transitional Adults," "Quiet Conformers," "T.G.I.F.'s," "Insecure Moralists," and "Small Town Traditionalists," (RJR–M–6, pp. 8–10). The T.G.I.F. (Thank God It's Friday) segment was the largest, containing about 30 percent of this population of 15- through 24-year-olds. Since 62 percent of the T.G.I.F. group were reported to be smokers, they were considered an important segment. The T.G.I.F. group primarily comprised underachievers who were "rooted in the present. They live for the moment and tend to be self-indulgent. . . . Achievement and leadership is not a goal for this group compared to others. Societal issues are relative nonissues. . . .They are the most prominent supporters of smoking . . . . They do read newspapers and some magazines, including *Playboy* and *Penthouse*. Heavy metal and hard rock are common music choices" (RJR–M–6, pp. 8, 21).

Portraying Youthful Behavior

As a matter of policy, "positive lifestyle images" were used by Imperial Tobacco Limited to suggest the continued social acceptability of smoking. The company chose models and activities to facilitate young people's identification with the company's products. Creative guidelines for the Player's brand, for example, specified that the target market would "emphasize the under-20-year-old group in its imagery reflection of lifestyle (activity) tastes" (AG–35, p. 42). The models used in Player's advertising were to be "25 years or older, but should appear to be between 18 and 25 years of age" (AG–35, p. 52).

R.J. Reynolds–MacDonald, however, learned that models can be too young appearing for the young consumer's taste. When the Tempo brand cigarette was test-marketed in selected cities, most of its media budget was allotted to out-of-home media, targeting key youth locations and meeting places close to youth-frequented sites, such as theaters, record stores, and video arcades. To target the young, who were perceived to be "extremely influenced by their peer group," the J. Walter Thompson advertising recommendations called for "imagery which portrays the social appeal of peer group acceptance—where acceptance by the group provides a sense of belonging and security" (AG–16, p. 4). The media featured young-looking models arm-in-arm, wearing casual clothes perceived as trendy by the young. The brand met with mixed results in the test market, however, in part because it was too explicitly young in character. Few teenagers, it seems, wanted an explicitly teen product, instead preferring to use products associated with adulthood.

Conveying Pictures of Health

The images used in many of Canada's cigarette ads were carefully crafted to feature attainable activities that appealed to youth but were not so intense as to be unbelievable in the context of smoking. The Player's Filter '81, Creative Guideline (AG–222) required that ads feature activities that "should not require undue physical exertion. They should not be representative of an elitist's sport nor should they be seen as a physical conditioner. The activity shown should be one which is practiced by young people 16 to 20 years old or one that these people can reasonably aspire to in the near future" (AG–222, pp. 1–2).

These images were tested to ensure that they elicited minimal counterargument from viewers. For example, in the Project Stereo Advertising Evaluation (AG–220), a windsurfing ad for the Player's brand received the following evaluation:

> The reaction to windsurfing as an activity is neutral with regard to whether or not the people who engage in it are likely to be smokers or not. However, the more physically fit and healthy-looking the protagonists, the stronger the no-smoking classification elicited. The same person sitting on the beach—perceived by most as resting after surfing—or shown carrying a surfboard—whether getting out of the water or walking toward the ocean—evokes different reactions regarding smoking. Respondents are willing to accept the man smoking while resting but are reluctant to think of him as a smoker while his well-built body is in full view (AG–220, p. 6).

Projecting Images of Independence

The brands most successful with teenagers seem to be those that offer adult imagery rich with connotations of independence, freedom from authority, and/or self-reliance. Imperial Tobacco Limited's Project Sting tested "overtly masculine imagery, targeted at young males" (Pollay 1989b, p. 24). Young males were seen as "going through a stage where they are seeking to express their independence and individuality under constant pressure of being accepted by their peers" (Pollay 1989b, p. 24). R.J. Reynolds' Export A brand had a special appeal for young Canadian teens and preteens, as the company recognized in its Export Family Strategy Document of 1982 (AG–222): "Very young starter smokers choose Export A because it provides them with an instant badge of masculinity, appeals to their rebellious nature and establishes their position amongst their peers" (AG–222, p. 7299).

Imperial Tobacco Limited's Project Stereo (1985) provided creative guidelines for the effective display of freedom and independence in advertising imagery designed to appeal to a young market. Its Final Report (AG–27) made recommendations for designing advertisements for the Player's brand that showed someone "free to choose friends, music, clothes, own activities, to be alone if he wishes"; who "can manage alone" and be "close to nature" with "nobody to interfere, no boss/parents"; someone self-reliant enough to experience solitude without loneliness (AG–27, p. 60).

Project Stereo also described how Player's and its closest rival for young males, Export A, both used images, not words, to convey the critical concepts of independence, self-reliance, autonomy, and freedom from authority. Both brands used advertisements that featured strong, masculine, hardy men who were typically alone in the fresh air of the outdoors. But as is shown in the chart below, the two competitors conveyed their respective images with relatively small yet important differences.

Player's Smoker's Image	**Export A Smoker's Image**
Chooses to be alone.	Is a loner.
Conveys masculinity but also gentleness.	Conveys machismo ruggedness.
Can show feelings.	Does not show feelings.
Can include women.	Excludes women.
Has a good job, is a good worker.	Is working-class.
Is adventurous.	Is a daredevil.
Is independent and strong willed.	Isn't concerned about society.

(AG–27, p. 18).

The more subtle, less excluding Player's image proved far more successful than the uncompromising Export A image.

Images of the American Ideal

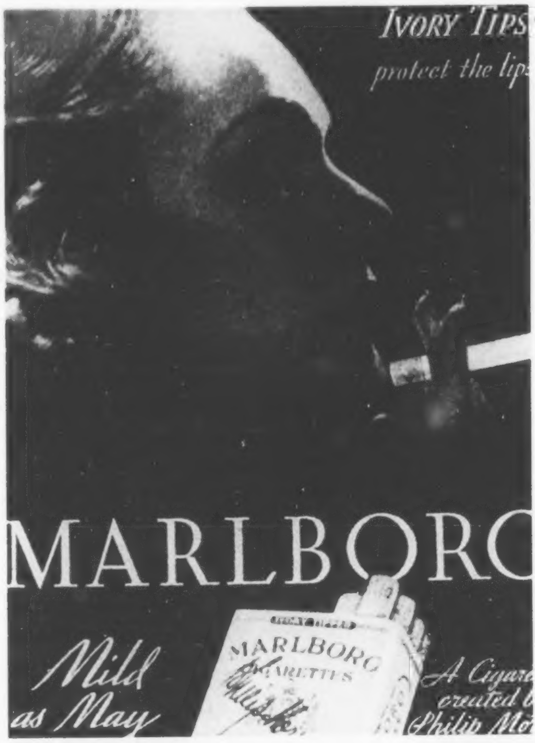
United States advertisers, too, have long thought that individualism and the stimulating notions of independence, self-reliance, and autonomy are important strategic concepts in ad development. The Marlboro cowboy (also known as the Marlboro man) epitomizes this stereotype of American independence. Usually depicted alone, he interacts with no one; he is strikingly free of interference from authority figures such as parents, older brothers, bosses, and bullies. Indeed, the Marlboro man is burdened by no one whose authority he must respect or even consider (see Figure 1).

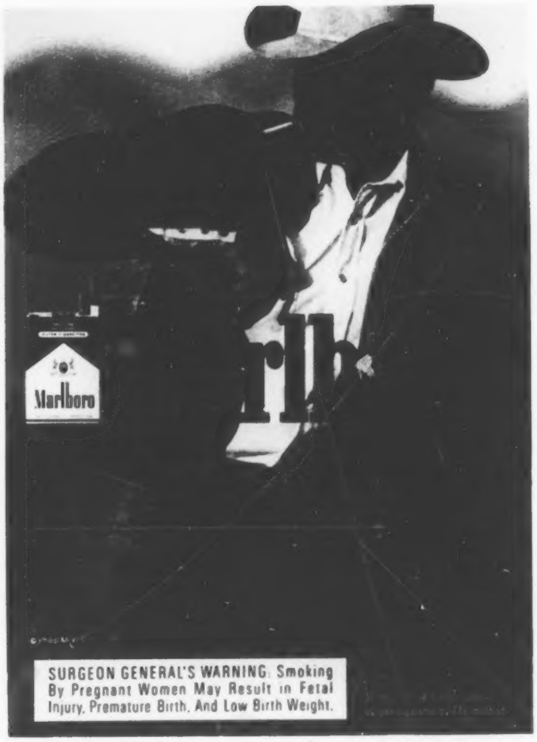
One account (Meyers 1984) describes the success of Philip Morris's George Weissman and Jack Landry, who were instrumental in making Marlboro the best-selling cigarette brand in the United States. Marlboro had long been sold as a woman's cigarette, with lipstick-colored filters and a "Mild as May" slogan (see Figure 1). The first attempt to reposition the brand as "male" featured the breathy, sensual singing of Julie London and male models with tattooed hands. But when Weissman, then head of marketing for Philip Morris, assumed responsibility for the campaign in the late 1950s, his research informed him that postadolescents in search of an identity were beginning to smoke as a way of declaring independence from their parents. Jack Landry, the advertising executive for Philip Morris, coordinated with the Leo Burnett agency and came up with "commercials that would turn rookie smokers on to Marlboro. . . .[that would convey] the right image to capture the youth market's fancy . . . [and project] a perfect symbol of independence and individualistic rebellion"—in other words, the Marlboro cowboy (Meyers 1984, p. 70). The power of the associative psychological style of advertising was demonstrated by the Marlboro brand's capture of a significant market share of starters every year, until it soon became the best-selling brand.

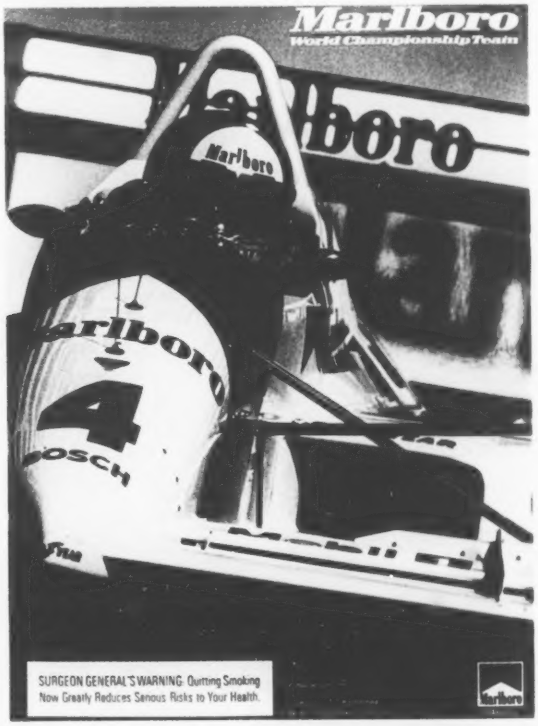
This success has proved long-lived. In 1993, Marlboro commanded 21 percent of the domestic market share—by far the largest share (Maxwell 1993). As Philip Morris's president and CEO, R. W. Murray observed, the Marlboro man still has a powerful attraction: "The cowboy has appeal to people as a personality. There are elements of adventure, freedom, being in charge of your destiny" (Trachtenberg 1987, p. 109).

Marlboro's success led to much imitation and competition in the industry. The FTC reported that one of the popular advertising strategies of the late 1960s was the use of associative themes, where an image portrayed "one or more personality characteristics which the advertiser hopes will appeal to the audience of existing and potential cigarette smokers. . . . The classic example of this approach is the Marlboro cowboy—ruggedly masculine, self-sufficient. . . . The theme of masculine independence has been used by several other advertisers" (FTC 1970, p. 8). Advertisements for Camel, Newport, and Old Gold were named as examples.

Figure 1. Selected Marlboro cigarette advertisements, 1937–1992


IVORY TIPS
protect the lip
MARLBORO
Mild as May
MARLBORO CIGARETTES
A Cigar
created b
Philip Mo


Marlboro
SURGEON GENERAL'S WARNING: Smoking By Pregnant Women May Result in Fetal Injury, Premature Birth, And Low Birth Weight.


Marlboro
World Championship Team
Marlboro
4
BOSCH
SURGEON GENERAL'S WARNING: Quitting Smoking Now Greatly Reduces Serious Risks to Your Health.

Sources: Clockwise from top left: *New Yorker* 1937; *Road & Track* 1990; *Road & Track* 1992.

In a parallel manner, advertisements for brands such as Virginia Slims appealed to feminine independence. An ad executive who headed the account for a leading female brand, and who requested anonymity, was quoted by the Wall Street Journal as stating, "We try to tap the emerging independence and self-fulfillment of women, to make smoking a badge to express that" (Waldman 1989, p. B1).

Over the past few decades, many advertising campaigns have featured race car drivers, and many brands (such as Camel, Marlboro, and Winston) continue to sponsor racing events and teams. A commercial study of three different executions of a 1976 Viceroy advertisement with close-ups of "a young man in auto racing garb" found that subtle visual differences caused by the model's appearance, positioning, or other visual staging devices could greatly affect consumer reactions. Despite identical verbal copy and layout in all three advertisements, one of them more strongly suggested that smokers of Viceroy had the desirable "positive personality characteristics including courageousness,

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independence, adventurousness and aggressiveness" (Schwartz 1976, p. 75).

The sponsorship of racing car events by Marlboro (see Figure 1) may seem inconsistent with the cowboy character, but it is not. The company's Vice President of Marketing Services, Ellen Merlo, explained: "We perceive Formula One and Indy car racing as adding, if you will, a modern-day dimension to the Marlboro Man. The image of Marlboro is very rugged, individualistic, heroic. And so is this style of auto racing. From an image standpoint, the fit is good" (*Business of Racing* 1989, p. 5A).

Historical Content Analyses of Cigarette Advertising

Introduction

The social sciences afford a variety of approaches for describing and analyzing the content of communications of all kinds, whether in the form of speeches, conversations, newspaper articles, signs, or advertisements. Specific communications, such as a single ad or the coherent set of ads that constitutes a campaign, can be examined in detail. Typically, in-depth approaches, such as semiotics, are discursive descriptions that deconstruct the message and its meaning through detailed consideration of the elements of the ad (e.g., words, symbols, images), their structure (e.g., layout and prominence of visuals, rhetorical devices, and emphasis), and the cultural context in which these appear (e.g., the meanings traditionally attached to the ad elements, alone or in combination). These methods describe in sophisticated, analytical terms the probable meaning of the message to the average audience member.

The term "content analysis" is also used to describe a formal set of sampling and coding techniques, whose intent is to produce objective numerical data descriptive of a set of communications, such as a collection of ads. These systematic methods code and count both the overt and latent content of ads by observing the verbal and visual elements within a set of predetermined definitions. The definitions can be coded for events at various levels of observation, from broad themes to specific minutiae. These definitions are employed by trained coders, who apply them to a systematically drawn sample of ads. The reliability of this coding task is usually measured and reported and depends upon how clear are the communications under study, how complex the definitions of interest, how difficult the coding task, how attentive the coders, and other factors. The sample can be either cross-sectional (representing many brands' advertising), longitudinal (tracing evolution of advertising over time), or both. Like other sampling, the representativeness of the sample studied and the resulting potential to generalize from the results are a function of the sampling strategy (e.g., drawn from certain sources, seasonally or randomly determined, a complete census).

The simultaneous pursuit of objectivity in content-analysis coding and meaningful observation often involves methodological judgment to weigh the various trade-offs and compromises. Some analysts (e.g., Ringold and Calfee 1989) deliberately limit their efforts primarily to the verbal content of the ads, analyzing the words in painstaking detail. The limitations of this careful but restricted focus and the inferences that can be appropriately drawn from it have been the subject of a sustained debate (Cohen 1989, 1992; Pollay 1989a; Ringold and Calfee 1990).

The next sections of this chapter discuss the more formal content analyses of historical samples of cigarette ads and focus on the more fundamental results, general tendencies, and broader conclusions. Within the limits of the noted sampling for each study, these analyses describe the universe of cigarette advertising for multiple brands, or of cigarette advertising in general, rather than for specific brands and their campaigns. In some studies, the content-analysis data descriptive of cigarette advertising are related to other information, such as product features, market shares, audience characteristics, or historical events.

Increase in Visual and Vivid Advertising

The first published report analyzing the content of cigarette advertising (Weinberger, Campbell, DuGrenier 1981) studied 251 cigarette ads found in the issues of *Newsweek*, *Sports Illustrated*, and the *Ladies Home Journal* during the years 1957, 1967, and 1977. The report noted an eightfold increase in the volume of cigarette magazine ads between 1957 and 1977, as the industry left broadcast media. The investigators found significant increases, as well, in the proportion of ads in color, at premium locations (e.g., on the back or inside covers of magazines), and with multiple pages. Both explicit and implied health claims were also found to have increased significantly; almost all ads for lower-tar products advertised in 1977 were "tombstone" ads (i.e., consisting of text and package display only—no models, nature scenes, sports paraphernalia, etc.). Using market data from leading national advertisers and the index of advertising listed by manufacturer, the analysis revealed that a firm's "share of voice" was almost perfectly correlated with its market shares; that is, all tobacco companies included in this study sample of print media were advertising their products in near-exact proportion to their market share.

Becoming Pictures of Health

Verbally explicit health claims, a prominent feature of early cigarette advertising, have been replaced by claims about filter effectiveness, mildness, and the mandatory warnings and disclosures. As scientific evidence of the health risks of smoking became increasingly known to the general public in the 1950s and 1960s, the pseudoscientific claims made by cigarette advertising in earlier decades (claims that using a given brand, for instance, would protect against "smoker's cough") were replaced by unadorned statements of filter effectiveness against tar and nicotine. These later health claims tacitly allowed that smoking was harmful, but they also strongly suggested that smoking a particular brand was significantly less harmful. Such health claims thus have the primary purpose of promoting sales for a separate product category: that of "low-tar, low-nicotine" cigarettes. Verbal health claims in advertising have otherwise been replaced by visual, connotative imagery—what can be called pictures of health.

Ringold (1987) reported on the verbal content of 211 cigarette ads drawn primarily from *Time* magazine from 1926 to 1985, partially supplementing the sample, as needed, with ads drawn from the *New Yorker*, the *Saturday Evening Post*, and *Life*, in that order. Although inexplicably omitting any Philip Morris brands, this sample sought one ad each for six brands: Camel, Chesterfield, Kent, Lucky Strike, Old Gold, and Viceroy. Detailed coding was done on the verbal content in headlines, subheads, and body copy. Even though all "mildness" assertions were treated as taste claims only, health claims were the most frequently made type of claim for the period before 1954. For the overall 1926–1985 study period, health claims were the third most frequent type of claim, representing 18 percent of all claims. This finding was true for five out of the six brands studied, and there was "little to distinguish the various brands in terms of the health claims frequently used" (Ringold 1987).

A study of the words and images of all 567 ads from 108 issues of *Life* (1938–1983) and *Look* (1962–1971) included the ads for 57 brands (Pollay 1991); 14 major brands accounted for 75 percent of the total sample. Multiple judges coded these ads for 12 major and independent thematic dimensions. Three of these dimensions were postulated to communicate healthiness: (1) "health/safety" made verbal claims about positive physical effects, medical use or endorsements, or reduced symptoms and risks, including filter-effectiveness claims (unless the text linked effectiveness to product taste); (2) "bold/lively behavior" provided images of active, athletic, or risk-taking behavior; and (3) "pure scenes" provided images of nature associated with wholesomeness, cleanliness, and purity, such as glaciers, mountain streams, or new-fallen snow. Other themes measured included "well made" (product quality), "good deal" (value for money), "enjoy" (pleasure and satisfaction), "female, male, glamour/luxury" (celebrities, status, wealth), "relax" (peace of mind), and "official" (tested or endorsed by authorities).

Judges found one or more of the healthiness themes in 60 percent of the studied ads, images of bold and lively behavior in 20 percent, and pure scenes in 30 percent. Some stereotypical differentiation of men and women was evident: ads featuring men were significantly more likely to use images of bold and lively behavior, whereas the ads featuring women were significantly more likely to use images of glamour and luxury.

Warner (1985b) studied 716 cigarette ads from *Time* for selected years from 1929 through 1984. Various visual, verbal, and thematic elements of the ads were coded: the presence or absence of smoke, the manner in which cigarettes were held, the nature of models employed, the degree of prominence given to health messages, and the types of themes not focused on health, such as humor, rugged individualism, and romance. Data were not reported for individualism, emancipation, or other themes of independence. Data were grouped according to their proximity to periods of intense public consideration of the health consequences of smoking—such as the health concerns raised in the early 1950s (particularly since increased promotion and supply of cigarettes during World War II had contributed to a larger population of young adult smokers [Blake 1985]), the first (1964) Surgeon General's report on smoking and health, and the Fairness Doctrine that required broadcast cigarette ads to carry health-risk messages during the period 1967–1970. Results show evidence of the dramatic growth in magazine advertising over the 56-year study period: the average number of cigarette ads per issue rose steadily from less than one per issue for the 1929–1952 period to over eight per issue for 1974–1981 (after the ban on radio and television had gone into effect). During the last two decades studied, the images in these ads had the notable characteristic of showing virtually no smoke. Although visible smoke appeared in half of the ads before 1964, after 1964 only 5 percent of lit cigarettes appeared to emit visible smoke, and after 1976 not a single instance of smoke was found in this sample. The imagery in those ads was increasingly, and apparently deliberately, becoming more pristine by eliminating smoke from ads.

The balance between the verbal and visual elements of the ads was measured in this study, as was the degree of health focus. Ads that relied more heavily on words than on pictorial images were judged as trying to convey a health message. Both the health focus and the balance between verbal and visual elements were found to be episodic; ads tended to verbally emphasize health themes during the years of major smoking and health events. Such ads often emphasized a health-related product innovation, such as scientifically designed filters. This general pattern seemed to end in 1964, the year of the first Surgeon General's report, during and after which ads became more visual. Warner (1985b) notes, "Industry advertising directors may have concluded that the most effective contemporary response to health concerns is an indirect one: conveying visual images of vibrant, physically fit, successful, sociable, and sexy people in physically active or glamorous settings, in other words, associating smoking with people who are the proverbial 'picture of health'" (p. 125). Similar observations were made by Rogers and Gopal (1987), who studied an unspecified number of ads from three issues of *Time* and *Life* magazines each year, at five-year intervals from 1938 to 1986. They noted that over time, positive health appeals were displaced by claims of having "less harmful" products, and that these in turn were displaced by "more and more lifestyle advertising . . . brand imaging . . . using more poster style layouts and color spreads . . . with very little body copy" (pp. 262, 266).

Other researchers have noted the episodic nature of cigarette advertising history but attribute the changes not to industry strategy or sophistication, but to the effects of regulation and self-regulation, such as FTC activity or industry self-regulatory codes. Ringold and Calfee (1989) report on the verbal content of 568 ads drawn primarily from *Time* magazine from 1926 through 1986. This sample is both longitudinal (N = 348), expanding on the sample of one ad per year for various brands reported earlier (Ringold 1987), and cross-sectional, using a sample of 25 ads each for the seven mid-decade years 1926, 1936, 1946, 1956, 1966, 1976, and 1986. The ads were coded along 27 general ad characteristics and 51 claim categories. The coding, described by the authors as conservative, treated all mildness claims as claims about taste that were irrelevant to health and treated all claims about filter innovations as claims about product quality, not about health. Nonetheless, results of the longitudinal sample show that 27 percent of all claims were health claims, making it the most common category, primarily because ads since 1965 were required to carry tar and nicotine disclosures (See "Warning Labels on Tobacco Products" in Chapter 6). Voluntary health claims were anywhere from 17 percent to 29 percent of total claims before 1954 but had nearly disappeared after that year.

In the longitudinal analysis, action-oriented ads—those depicting competitive sports, adventurous pursuits, or leisure behaviors—were more than twice as common (42 percent of all ads) as those showing all other types of activity, such as working, eating, or shopping (17 percent of all ads). Almost identical results were found for the cross-sectional sample of 220 ads. No data were reported for how the frequencies of these images of activities changed over time.

Advertising That Targets Youthful Audiences

Albright et al. (1988) studied cigarette ads in magazines that reach young readers (*Rolling Stone, Cycle World*), female readers (*Ladies Home Journal, Mademoiselle*), or general adult readers (*Time, TV Guide, Ebony, Popular Science*). All cigarette ads in one issue for every year from the 1960s through 1985 were coded, yielding 778 ads for analysis. Like other analysts, Albright et al. found that the volume of magazine advertising increased dramatically during this period, stabilizing after 1977 at six to seven ads per issue. Within this study sample, the proportion of total ads appearing in the magazines reaching younger audiences grew significantly over time to become 36 percent of the total. The analysts concluded that although these data may not fully represent the overall market trends, "women and adolescent magazine readers are exposed to a large quantity of cigarette ads, regardless of the advertisers' intent" (Albright et al. 1988, p. 232).

Altman et al. (1987) analyzed the themes and images employed in this same sample of magazines. The study focused on the ads (78 percent of the total sample) that showed a setting or had a model present. These were coded for elements of the act of smoking, the presence of a low-tar or low-nicotine theme, and suggestions of the "vitality of smoking." The latter concept was measured with subcategories of adventure/risk (e.g., rock climbing, sailing, racing cars), recreation (e.g., playing tennis, surfing), and romantic/erotic appeal (e.g., scantily dressed models, moonlit settings).

Images of risk and adventure, recreation, and erotic or romantic display in youth magazines increased significantly over this period (1960s to 1985). Ads in youth magazines were significantly more likely than ads in other magazines to depict images of adventure or risk, were more likely to display recreation, and were somewhat less likely to depict erotic imagery. Tombstone ads were less likely to appear in youth magazines, or conversely, youth magazines were more likely to feature image-based ads.[2] Like Warner (1985a), Altman et al. found a decline in the evidence of visible smoke and the act of smoking.

The database of Altman et al. (1987) was extended by Basil et al. (1991), who examined differential targeting, or how cigarette advertising strategies varied depending on the characteristics of the primary readership. These researchers added two magazines with a primarily black readership (*Jet* and *Essence*) and updated the sample to include magazines from the 1960s through July 1989 for an enlarged sample of 1,171 ads. These investigators also delineated three subcategories of romantic/erotic themes: (1) horseplay—males and females cavorting; (2) erotic content—romantic or sexy situations, innuendo; and (3) seductive poses—wanton looks or suggestive glances or poses.

From 1984 through July 1989, the number of ads per magazine issue declined in general in men's and women's magazines but was relatively stable in those magazines reaching black and youth audiences. The most common type of ads in men's and youth magazines showed models engaged in lower-intensity sports, such as water skiing or volleyball. Analysis of variance between magazine types found that ads depicting incidents of horseplay and romantic contact were most prevalent in black- and youth-oriented publications. A separate analysis found that incidents of horseplay had grown significantly more frequent over time and were significantly related to the average age of a magazine's readers; magazines with a younger readership were more likely to run ads featuring horseplay. Comparing results for all consumer segments, the researchers concluded that these ad strategies appear

> to depend on the segment's current rate of smoking. . . . Readers with high smoking rates are often pitched to choose certain brands with appeals based on some aspect of the brand rather than on the models depicted in the ad. However, readers with low smoking rates appear to be given appeals that focus on models, suggesting that smoking is fun, helps you make friends, and will make you desirable. Groups with lower smoking rates are more frequently given appeals that appear to be attempting to recruit new smokers (Basil et al. 1991, p. 88).

The work of King et al. (1991) partially contradicts and partially replicates findings from the previously described studies. King et al. followed a similar sampling strategy, drawing ads from one issue for each available year, between 1954 and 1986, for each of eight magazines representing five distinct audience orientations: general interest (*Time*), older women (*Ladies Home Journal* and *Redbook*), younger women (*Vogue*), older men (*Popular Mechanics* and *Esquire*) and younger men (*Sports Illustrated* and *Playboy*). This sampling yielded 1,100 cigarette ads for an analysis that focused on visually oriented content.

Like other studies, King et al. noted a large increase in magazine advertising: the number of ads per issue was more than ten times greater for the period 1971–1983 than for the period 1954–1970. *Playboy* had both the largest number of cigarette ads per average issue and the lowest median audience age. Unlike earlier studies, however, King et al. found no systematic relationship between the median age of a magazine's audience and the average number of ads published.

As was found in previous multiyear studies, cigarette ads in general relied more and more on visual imagery and became increasingly larger (e.g., more ads were multipaged), more photographic, more colorful, and more visual than verbal. The volume of cigarette ads varied significantly over time; the greatest changes were a decline in the proportional importance of general-interest magazines, a relative stability for both older and younger men's magazines, and a growth in both older and younger women's magazines. The ads in the younger men's and women's magazines together constituted 39 percent of the total cigarette ad volume in this sample of magazines during 1954 through 1970, 33 percent during 1971 through 1983, and 45 percent during 1984 through 1986. Similarly, Warner and Goldenhar's (1992) analysis of the use of 92 magazines as cigarette advertising vehicles from 1959 through 1986 found the largest increase in women's magazines and in magazines reaching predominately blue-collar readers.

Imaging Individualism, Independence, and Self-Reliance

In King and colleagues' (1991) analysis, the activities of the models fall into six categories: adventure (operating a speedboat), recreation (playing ball), erotic (being romantic with another), sociability (talking with peers), working (ranching), and individualistic/solitary (reading a book, watching a sunset). The study defined individualism solely in terms of restful behaviors; this decision and the resulting classification of the Marlboro cowboy as "working" rather than "individualistic solitary" are debatable elements of this study, but the results nonetheless indicate the importance of the independence theme.

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[2] Research (such as Fischer et al. 1989) that has examined the effect that health warning labels in cigarette advertising have on young people is discussed in Chapter 6.

For example, the most frequently cited categories of ads that reached younger women were individualism (29 percent), recreation (26 percent), and sociability (20 percent). The most frequently pictured activities in ads that reached younger men were individualism (21 percent), work (21 percent), recreation (20 percent), and adventure (14 percent). The authors noted that "portrayals of individualism were more likely to appear in cigarette ads placed in younger men's and younger women's magazines." Despite this and other noted differences between ads in various types of media, "this study found a striking universality of theme, regardless of audience orientation. Individualistic/solitary and recreational themes were most frequently portrayed in virtually all magazine types" (King et al. 1991, p. 77).

Schooler and Basil (1990) studied all types of billboard ads in San Francisco neighborhoods. Billboard advertising is held to be important because it allows neighborhood-level targeting and ethnic segmentation. Like point-of-sale store signage, billboard advertising has more permanence than magazine ads, allowing multiple incidental exposures for all ages of persons who are on the neighborhood street regularly, going to work, stores, or schools. Of the 901 billboards photographed between May 1985 and September 1987 in 210 commercial districts, tobacco ads were the most frequent (19 percent), closely followed by alcohol (17 percent). Black and Hispanic neighborhoods had significantly more tobacco and alcohol ads than white or Asian neighborhoods. Billboards of any type were 1.7 times more common in black neighborhoods (2.2 per 1,000 people) than in a citywide sampling (1.3 per 1,000). Tobacco billboard ads were even more common in black neighborhoods, appearing at 2.4 times the citywide rate.

The content of these ads was coded for several social cues: sex, ethnicity, apparent social "class" of the models, reward cues (e.g., romance, sociability, recreation, sportiness and active lifestyle, and adventure/risk), and attractiveness cues (e.g., rugged individualism, machismo, fashionableness, sex appeal, fame/expertise, and friendliness). The most prevalent reward cue images associated with smoking were sportiness and active lifestyle, recreation, and adventure/risk. The most prevalent attractiveness cue on tobacco billboards was rugged individualism or machismo. The statistically significant results indicated how important social cues are to these tobacco products. The study suggests that people are more likely to be portrayed in cigarette and alcohol ads (59 percent) than in advertising generally (16 percent), and cigarette and alcohol ads were more likely than others to use models that matched the ethnicity of the neighborhoods.

When advertising for smoking and for alcohol were compared, the study concluded that alcohol ads use modeling cues that suggest that product consumption will enhance one's social life, whereas tobacco billboards emphasize rewards that are more individualistically oriented. "Rugged individualism," the study observed, "was the most prevalent attractiveness cue on tobacco billboards. The epitome of these ads is the Marlboro man" (Schooler and Basil 1990, p. 15). These research results are reported in brief elsewhere (Altman, Schooler, Basil 1991), and additional statistical analyses of the same database reach the same conclusions (Schooler, Basil, Altman 1991).

Altman and colleagues' (1987) analysis of 778 magazine ads (from the 1960s through 1985) also found that images of adventure and risk had become more prevalent across all magazine types. Youth magazines were even more likely than other types to depict images of adventure/risk and recreation.

Other Related Research

Perceptions of Models' Ages

Mazis et al. (1992) studied the perceived age of the models used in cigarette ads appearing in 97 magazines in October 1987. In the 101 issues (some magazines were published more often than once a month) that contained cigarette ads, 393 cigarette ads for 22 brands were found, of which 119 were unique (i.e., did not appear in another of the 97 magazines that month). Narrowing the sample to ads with models whose faces were "clearly visible" (i.e., their faces were at least two-thirds exposed and were depicted close enough to discern approximate age) yielded 50 unique ads with 65 models. Two samples of 280 and 281 judges were recruited from a racially and economically diverse shopping mall, with quotas that guaranteed a cross-section of gender and age (13 years old and older).

Each participant was asked to estimate the age and assess the attractiveness of the models in a random sample of 25 ads. These data were compared to data on the median age of the audiences of the magazines used as sources. A positive and statistically significant correlation was found between perceived model age and median audience age. For example, young-looking models tended to appear in media read by young audiences—a correlation advantageous to the advertisers, since young viewers proved more likely than older viewers to perceive that attractiveness declined with advancing perceived age.

Fourteen (22 percent) of the 65 models were judged, on average, to be less than 25 years old, and eleven (17 percent) were attributed a mean perceived age far enough below 25 years old to be statistically significant. Nine of these young-looking models were women, four of them in various Virginia Slims ads. "Some cigarette ads," the authors concluded, "are clearly violating the industry's voluntary code that requires models not to 'appear to be less than twenty-five years of age'" (Mazis et al. 1992, p. 35).

Ads That Target Women

The history of campaigns that target women has been reviewed by discussing specific campaigns and generating data for advertising intensities (i.e., the numbers of ads appearing in each magazine) for 1971 through 1984 (Ernster 1985). Tabulation of the number of ads in *Better Homes and Gardens, Ladies Home Journal*, and *McCall's* revealed that ad intensity grew steadily during the 1970s, peaked in 1979, and declined thereafter. Nonetheless, in 1984, an average of more than 10 cigarette ads appeared in each issue of these magazines and of *Cosmopolitan, Family Circle, Glamour, Harper's Bazaar, Mademoiselle, Redbook, Vogue,* and *Woman's Day*.

A similar report (Howe 1984) on the history of women and cigarette advertising included graphs of the frequency of cigarette ads showing women smoking that appeared in *Life* (for the period 1936–1972) and *Ebony* (for 1945–1980). These ads peaked in the mid-1960s, and again in the early 1970s. The report observed that in these peak years, the ads generally focused on "women jogging, biking, backpacking and playing tennis, all while smoking a cigarette, too. It would be difficult to argue that these positive images are not influential on young, image-conscious teenagers" (p. 8).

Ads That Target Blacks

The cigarette ads targeting blacks in *Ebony* from 1950 through 1965 were studied by Pollay, Lee, and Carter-Whitney (1992). When the full census of cigarette ads from *Ebony* (N = 540) were compared with cigarette ads from a matching sample of *Life* issues, the investigators found that the ads targeting blacks were significantly more likely to use athletes and were two to three years tardy in announcing to black consumers new products with tar- and nicotine-reducing filters. Furthermore, cigarette advertising was initially more prevalent in *Life* than in *Ebony*, but after 1960, *Ebony* issues carried more cigarette ads.

The cigarette industry's greater intensity in targeting blacks through advertising has also been observed in more contemporary studies. In 1985, a comparison of advertising in selected magazines directed at white and black audiences (Cummings, Giovino, Mendicino 1987) found that the magazines targeting blacks had significantly more cigarette advertising and more ads for menthol brands, which are preferred by a much higher proportion of blacks than whites (see "Cigarette Brand Preference" in Chapter 3). This racial disparity may mark the cigarette industry's reaction to the notable decline in black adolescent smokers during the past decade (see "Trends in Cigarette Smoking" in Chapter 3). A review of cigarette promotional practices in 1985 noted the diversity of methods for reaching black audiences, including the growing use of sponsorships of athletic, cultural, civic, fashion, and entertainment events. Especially noteworthy was the intensive use of smaller billboards in black communities; these ads accounted for 37 percent of all billboards, and most featured menthol brands. In contrast to the larger highway billboards, smaller billboards are usually placed low and close to the street—and thus visible to passersby of all ages.

Recently, R.J. Reynolds attempted to introduce a new brand of cigarettes, Uptown, to the black community in Philadelphia (Robinson et al. 1992). Through the efforts of black leaders, who mobilized their communities, the Uptown Coalition emerged. The Philadelphia community created the agenda rather than allowing the tobacco industry to dictate it. Media messages were carefully framed, and Uptown Coalition spokespersons were given clearly prescribed roles. In 1990, R.J. Reynolds abruptly canceled the launch of Uptown. The Uptown Coalition was historic because it represented the first community-based initiative that succeeded in getting the tobacco industry to take a cigarette out of production.

Promotional Efforts of the Tobacco Industry

Introduction

Whereas the role of advertising is primarily cognitive and affective (affecting consumers' knowledge, beliefs, and attitudes), the role of promotional efforts includes a substantial conative (action-affecting) component (Kotler 1991). A cigarette advertisement, regardless of how compelling, is unable to put a cigarette into a consumer's hands. At best it can create desire or an interest in smoking. Cigarette promotion, however, can use sampling to put a cigarette into a consumer's hand—along with, in some instances, the lighter to ignite it. Promotion can also target a product to those specific consumers most likely to respond to a manufacturer's appeals (Rossiter and Percy 1987).

Cigarette marketers use several of the major categories of promotion to facilitate both the entrance of new smokers to the market and their development of brand loyalty. Because of the rapid growth in cigarette promotional expenditures (FTC 1992) and the importance of these expenditures in potentially recruiting new smokers, the following discussion will analyze each of these major categories of cigarette promotion. The recency of this growth, however, limits the amount of research this report can draw upon.

Public Entertainment

The cigarette industry uses the sponsorship of public entertainment events to bypass broadcast advertising bans and self-regulatory constraints. Sponsorship is an efficient way for an advertiser to have its brand name and logo achieve the equivalent effect of broadcast advertising without having to include any government-mandated warnings. Thus, cigarette manufacturers sponsor a wide array of sporting events (e.g., the Virginia Slims Tennis Tournament, the Winston Cup series, and auto racing in general through sponsoring particular cars and drivers) and other forms of public entertainment (e.g., the Kool Jazz Concert). The association of the brand name with the event is an advertising association for the brand. For example, through racing events and race cars bearing the Winston and Camel brand names, R.J. Reynolds has become the leading sponsor of automobile and motorcycle racing in the United States (Blum 1991). The association between events and cigarettes is so clear that in some markets, when ads selling tickets for a sponsored event (such as the Virginia Slims Tennis Tournament in Newport, Rhode Island) are run in local newspapers, the ads carry the mandated cigarette health warnings. Sponsorship can also preempt opposition to cigarettes among those who view sponsorship as necessary for the funding of an event. Despite the stated health threat, the association of the cigarette brand name with the event continues unabated on broadcast media, and event programming continues to feature cigarette brand logos. In the 1989 Marlboro Grand Prix telecast, for example, the Marlboro logo could be seen for over 46 of the 94 total minutes of broadcast time (Blum 1991). Such sponsorship is clearly viewed as delivering a brand message by the marketer.

Event sponsorship also provides access to youth markets of potential smokers (Buchanan and Lev 1990). Because youth do not predominantly compose the attendance or viewership of such sponsored events, however, cigarette advertisers can argue that they are not actively targeting youth. Yet given the heavy concentrations of young people in these audiences, and given the limited venues available to cigarette advertisers to present their images to children, sponsored events may be among the most cost-effective promotional mechanisms.

Two studies conducted with children and adolescents support the observations that cigarette industry sponsorship reaches young people. Aitken, Leathar, and Squair (1986) conducted a study to determine children's awareness of cigarette brand sponsorship of sports and games in the United Kingdom. Young people from ages 10 through 17 years old were asked what they understood by the term "sponsorship" and whether they could recall any cigarette brands that sponsored sports. The authors found that 13 percent of 10- and 11-year-old children and 43 percent of 16- and 17-year-olds mentioned that sports sponsorship entailed both a company's financial sponsorship of sporting events and its opportunity to advertise its products; 80 percent of 16- and 17-year-olds mentioned at least one of these two components of sponsorship. More than half of those 12 years old and older correctly associated at least one sponsored sport and the brand of the sponsoring cigarette company. Even children younger than age 11 identified the sponsored sports as activities linked with excitement. These findings supported those of Ledwith (1984), who also found that many 12- through 17-year-old schoolchildren were able to correctly identify sponsored sports and the sponsoring cigarette brand.

A secondary effect of sponsoring sports events is that the brand names become closely associated with the sports they sponsor. Ledwith (1984), for example, found that the likelihood of linking a sport with a brand of cigarette was directly related to the time spent watching that sport. The study also found that brand awareness increased substantially following the televised broadcast of a major sporting event sponsored by that brand. Thus, Marlboro and Winston have become associated with auto and sports car racing, and Virginia Slims has become associated with tennis; both brands also have become associated with the self-image messages these sports convey. Cigarette smoking may thus appear to receive an implied endorsement from race car drivers, whose expertise is associated with their ability to thoughtfully assess risks, and from tennis players, whose success partly depends on their physical endurance—a trait medically proven to be undermined by cigarette smoking.

Tobacco company sponsorship has not been limited to cigarettes. Connolly, Orleans, and Blum (1992) reported that in 1991, Skoal and Copenhagen, the two smokeless tobacco brands preferred by adolescents, were promoted on national television through their sponsorship of professional rodeo, hunting, formula car racing, "monster" truck racing, drag racing, sprint car racing, and stock car racing. The investigators concluded that "the harmful effects of tobacco are camouflaged against the backdrop and thrill of athletic victory" (p. 353).

Sponsored athletic and entertainment events also provide a venue for product sampling. In areas in which cigarette sampling is legal, free cigarettes and other specialty items can be distributed at these events.

Sampling and Specialty Items

Distribution of free samples is one of the most powerful devices available to marketers. It allows a company to put its product into the hands of possible consumers in circumstances where consumers are more likely to try it (e.g., outside of work or school). In the case of cigarettes, the power of sampling may be especially great (Popper 1986), because these are free samples of an addictive product. Although the cigarette manufacturers argue that samples are not intended for nonusers or minors, there is little evidence of distribution control (U.S. Congress 1986; Davis and Jason 1988).

The power of sampling in the cigarette marketplace is reflected by industry growth. Expenses for distributing samples increased from just under $25 million in 1975 to over $100 million in 1990 (FTC 1992). The tobacco industry agrees, however, that samples should not be given to anyone under age 21 or on school, college, or university campuses (Tobacco Institute 1986). Even more notable is the growth (from $10 million in 1975 to over $300 million in 1990) in the distribution of specialty or premium items (FTC 1992). These items are not simply related to tobacco products by bearing a brand name. Cigarette lighters, for example, are frequently provided with a sample cigarette. The lighter both facilitates trial of the cigarette sample and provides a brand-name reminder once the sample has been consumed.

Premium items also convey an advertising message without an appropriate associated warning. Figure 2 displays two pages of a 1993 *Camel Cash Catalog*. Premium and specialty items from this catalog can be obtained by sending in the listed number of "C-notes," which can be collected from packs of Camel cigarettes. Although a promotional package will often include a health warning along with a specialty item (such as a T-shirt or thong sandal), the warning does not appear on the item (Slade 1992). Since many specialty items include the imaginative content of the cigarette brand's advertising campaign, they provide ongoing advertising without any required health warnings. In a recent George H. Gallup International Institute survey of 1,125 adolescents nationwide, about half of the adolescent smokers reported that they had received promotional items from tobacco companies, as had one in four nonsmoking adolescents (Gallup 1992).

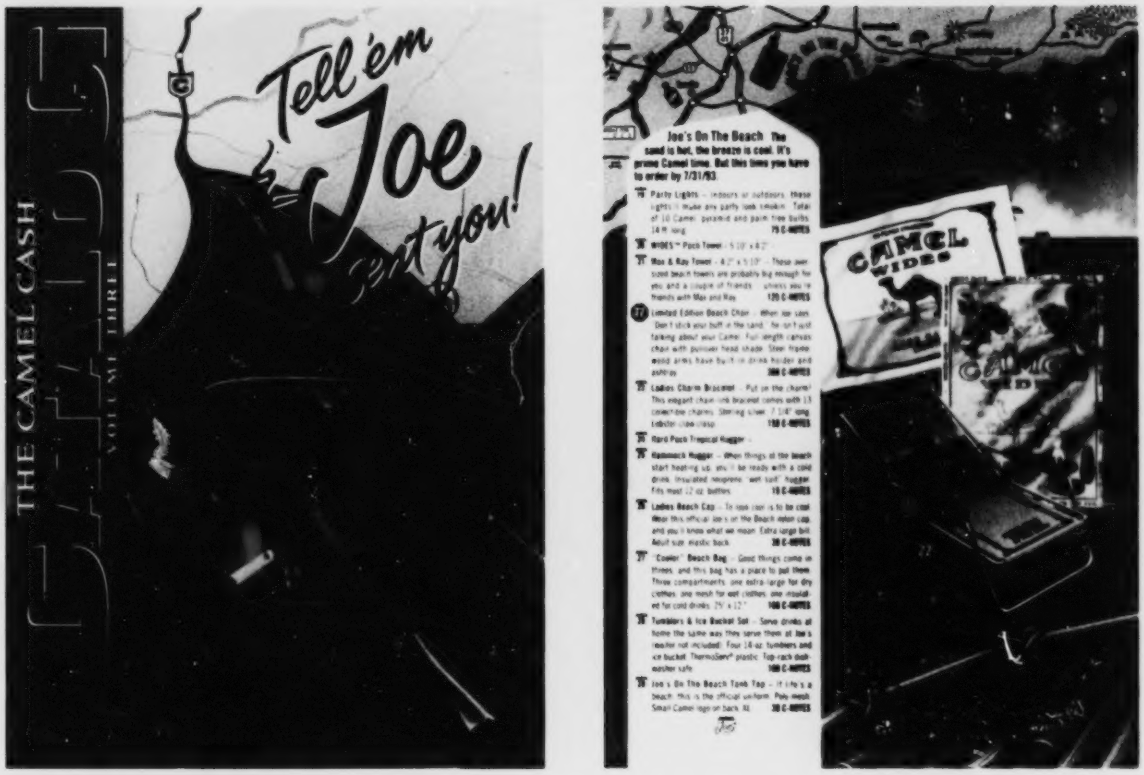
Other Promotional Expenditures

In 1990, three out of every four advertising and promotional dollars spent by the cigarette industry were devoted to promotional allowances, amounting to a total of over $3 billion. Though this amount includes cooperative advertising and payments to wholesalers, its primary function is to pay retailers to continue to display and vend cigarettes from prominent locations in their store.

The over $300 million spent by the tobacco industry on point-of-sale advertising in 1990 (only 10 percent less than the $328 million spent on cigarette advertising in magazines that year) is intended to bring the images of cigarette enjoyment to consumers at the store. For a brand-loyal smoker, the reminder value of a point-of-sale display is low. Therefore, to the extent that these displays focus on brand image, they may not only encourage experienced smokers to switch brands but also encourage new smokers to experiment with a particular brand (and with its associated brand image). The $1.3 billion spent on promotional allowances and point-of-sale displays combined are thus funds potentially directed at new, youthful smokers.

Retail value-added promotion consists of those activities (coupons, special price offers, 25-cigarette packs, etc.) that effectively reduce the cost of cigarettes. The industry argues that this promotion is clearly interbrand

Figure 2. Pages from *The Camel Cash Catalog*, Volume Three



Joe's On The Beach The sand is hot, the breeze is cool. It's prime Camel time. But this time you have to order by 7/31/93.

Source: R.J. Reynolds Tobacco Co. (1992).

competition. Although this is undoubtedly the case for some price offers, value-added promotion has two other effects. The first is to reduce the cost of entering the market—a notable effect, since some research studies indicate that the cigarette market is price sensitive (see "Effects of Excise Taxes on Tobacco Use" in Chapter 6). Any money-saving action that facilitates market trial and adoption may disproportionately affect youth, who usually have slim financial reserves and low earning power. Recently, Philip Morris began aggressive price-cutting promotions using coupons for Marlboro (Levin 1993), the predominant brand used by teenagers (CDC 1992). The second effect of coupons and other retail value-added devices is to encourage repeat purchases. Often coupons are enclosed with sample or trial packs and are included with other brand-trial devices. In using these coupons, the smoker moves toward habitually purchasing and using a particular brand and identifying with that brand's image. Moreover, coupons can encourage new users to progress from a trial stage of smoking to regular, addicted use of cigarettes.

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Research on the Effects of Cigarette Advertising and Promotional Activities on Young People

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Introduction

A substantial and growing body of scientific literature has reported on young people's awareness of, and attitudes about, cigarette advertising and promotional activities.[3] Research has also focused on the effects of these activities on psychosocial risk factors for beginning to smoke. Considered together, these studies offer a compelling argument for the mediated relationship of cigarette advertising and adolescent smoking. To date, however, no longitudinal study of the direct relationship of cigarette advertising to smoking initiation has been reported in the literature. This lack of definitive literature does not imply that a causal relationship does not exist; rather, better quantification of exposure, effect, and etiology is needed. Important data from research conducted for the tobacco industry are not available; such information would add considerably to our knowledge. A definitive study, such as a randomized control trial with young people exposed and not exposed to cigarette advertising, is both practically and ethically impossible. What is possible and needed is research that is longitudinal and multivariate, that takes advantage of recent statistical modeling methods, and that uses large samples of children and young adolescents who have not tried smoking and who have had relatively little exposure to cigarette advertising.

The issue of causality is addressed in this section by examining the effect of cigarette advertising and promotional activities on the known psychosocial risk factors (discussed in detail in Chapter 4) for the initiation of smoking. If advertising and promotional activities consistently affect these factors—factors such as self-image, the functional meanings of smoking, normative expectations, and intentions to smoke—then these activities may also affect smoking onset. This mechanism is especially plausible in the United States, where cigarette advertising and promotional activities are pervasive.

During an unusual historical period, July 1, 1967, through December 31, 1970, antismoking messages were widely aired on television and radio as part of the FTC's Fairness Doctrine. These messages were aired until a complete ban on prosmoking advertising on radio and television took effect on January 1, 1971. For those three and one-half years, the American public was exposed to both prosmoking and antismoking messages on radio and television. A carefully designed study of nearly 7,000 adolescents (Lewit, Coate, Grossman 1981) found that having both sets of messages on radio and television had the effect of reducing adolescent smoking rates; the impact was strongest during the first year of the antismoking messages. These study findings suggest that a nationwide, well-funded antismoking campaign could effectively counter the effects of cigarette advertising in its currently permitted media forms.

Young People's Exposure to Cigarette Advertising

Several research studies show that young people are aware of, and respond to, cigarette advertising. In a recent Gallup (1992) study, 87 percent of the 1,125 adolescents surveyed nationwide could recall recently seeing one or more tobacco company advertisements. Similarly, Pierce et al. (1993) found in their study of nearly 7,000 California adolescents that over 90 percent of the 12- and 13-year-olds could name a brand they had seen advertised. Half of the adolescents in the Gallup survey could identify the cigarette brand name associated with at least one of four cigarette slogans (Gallup 1992).

Chapman and Fitzgerald (1982) tried to determine the level of awareness of cigarette advertisements among 11- through 14-year-olds in Australia and the possibility of a relationship between awareness of advertisements and smoking behavior. Data were collected on smoking prevalence and preferred brands. Participants were asked to identify the cigarette brands advertised in photographs of eight print-media cigarette advertisements that had been edited to remove any identifying writing. The children were also asked to complete edited advertising slogans. Children who reported smoking in the last four weeks were almost two times more likely to correctly identify the advertisements and complete the slogans than were children who reported that they had not smoked during that period. Smokers' preferred brands generally corresponded with the advertisements and slogans most often correctly recognized. Of the 130 brands of cigarettes available on the market at the time of the study (1981), just four brands accounted for cigarettes smoked by nearly 80 percent of these adolescent smokers.

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[3] Recent evidence of the effects of tobacco advertising on adult tobacco consumption can be found in the United Kingdom Department of Health document, *Effect of Tobacco Advertising on Tobacco Consumption: A Discussion Document Reviewing the Evidence* (UK Department of Health 1992).

In the United Kingdom, Aitken, Leathar, and O'Hagan (1985) followed a procedure similar to that used by Chapman and Fitzgerald. They showed cigarette advertisements, interspersed among advertisements for other products, to groups of male and female schoolchildren (aged 6 through 16 years) from Glasgow's inner-city areas (most of whose residents were of lower socioeconomic status) and suburban areas (most of whose residents were of higher socioeconomic status). Chapman and Fitzgerald's findings that large proportions of children were aware of cigarette advertisements were supported in this study and were extended to include younger children. Among some of the 12-year-olds and most of the 14- and 16-year-olds in the Glasgow study, the advertising images elicited comments that indicated the young people's perceiving implicit, supposedly adult themes, such as independence, sex appeal, and success.

In a separate study, Aitken et al. (1987) showed nine color photographs of different cigarette advertisements to 12- through 17-year-olds. When the young people were asked if they had seen any of the advertisements before, 83 percent of the 6- and 7-year-olds and 91 percent of the 16- and 17-year-olds recalled seeing the same ad. When asked to match the various ads to brief verbal descriptions of the ads, the study subjects in the three oldest age groups (those 12 through 17 years old) succeeded at a level greater than chance.

Together, the results from these studies show that even relatively young children are aware of cigarette advertising and are able to recall particular advertisements. Older adolescents are moreover capable of interpreting the advertisements in imagistic terms related to attractive features of adult life.

Opinions on Cigarette Advertising and Smoking Behaviors

O'Connell et al. (1981) surveyed more than 6,000 students aged 10 through 12 who were drawn from a sample of 88 primary schools in New South Wales, Australia. Logistic regression was used to determine the relative importance of various personal and social environmental factors in relation to the proportion of children who reported smoking one or more times per week. The factors included friends' smoking, approval of tobacco advertising, siblings' smoking, the amount of money available to spend weekly, gender, age, and parents' smoking. As part of the same study, Alexander et al. (1983) identified factors associated with change in smoking status (both beginning and ceasing to smoke) over the 12 months between the baseline and follow-up surveys. Of the children who reported not smoking during the month preceding the baseline survey, significantly more of those who at baseline approved of cigarette advertising reported smoking during the month preceding the follow-up survey than did those who disapproved of cigarette advertising. Similar results were found for the children who reported smoking during the month preceding the baseline survey. The study thus found a positive relationship between approving of advertising and subsequently taking up smoking, and between disapproving of advertising and quitting smoking.

Armstrong et al. (1990) conducted a large randomized trial among seventh-grade students (13 years old) in Western Australia in which peer-led and teacher-led programs concerning social influences were evaluated. When the students were resurveyed one year and two years after the intervention, the results identified factors associated with beginning to smoke. Both boys and girls who at baseline reported that cigarette advertisements made them think they would like to smoke a cigarette were significantly more likely to have adopted smoking at the one-year and two-year follow-up surveys than those who did not report feeling this way.

Aitken and Eadie (1990) examined whether the awareness and appreciation of cigarette advertisements were independent of other predictors of adolescent smoking. In this study, 868 Glasgow adolescents between the ages of 11 and 14 years were selected at random and interviewed privately in their homes. Older adolescents, boys, and current smokers in the sample tended to approve of cigarette advertisements and were also more likely to correctly identify cigarette advertisements that carried no brand identification. In general, smokers were more successful than nonsmokers at identifying cigarette advertisements, were more likely to have siblings who smoked, tended to be more approving of cigarette advertisements, and were less likely to perceive that their parents strongly opposed smoking. These findings suggest that advertising may reinforce the habit of smoking, even among new, young smokers.

Young People's Responses to Different Types of Cigarette Advertisements

Huang et al. (1992) reported on the preferences of seventh- and eighth-grade children (average age 14) concerning three categories of cigarette advertisement: ads with cartoons, those picturing human models, and those with only the cigarette package and words (tombstone ads). The study was a cross-sectional survey conducted in April 1991 among 243 students in two junior high schools in Chicago. Seventy percent of the students were black, 22 percent white, 3 percent Hispanic, 2 percent Native American, 1 percent Asian, and 2 percent from other races. Analyses were limited to responses of the black and white subjects. The subjects first were asked to use five-point scales to rate how much they would like to embody the following 19 characteristics: athletic, good-looking, kind, slim, macho, smart, sexy, average, fun, special, independent, cool, afraid, overweight, underweight, tough, important, mature, and immature. They were then shown slides of 13 current cigarette ads representing nine brands taken from nine magazines obtained at a local supermarket newsstand. The students were asked to indicate how much they liked each ad and how likely they would be to buy the brand of cigarettes advertised. For each ad with either cartoon or human models, students were asked to rate the models on the same 19 characteristics used to describe their ideal self-image.

Students preferred advertisements with cartoons; ads with human models were the next most popular, and tombstone ads were liked least. Specifically, both black and white students ranked the two advertisements featuring Camel cigarettes' cartoon camel mascot Old Joe first and second; this preference was more marked among white students. Advertisements with black models were more appealing to black students than to whites, and ads featuring the Marlboro cowboy (who is white) were more appealing to white students than to blacks. Among students who smoked, the buying preferences for all brands closely paralleled the reported ad appeal.

A factor analysis based on the 19 rated attributes identified five groupings of the advertisements. Female models were seen as predominantly "slim" and "good-looking." Joe Camel was "cool" and "fun," as were the two black models in a Salem ad. The Marlboro man was perceived as "tough" and "macho." On the other hand, a Montclair model was ascribed no positive attributes, but was predominantly rated as "not sexy" and "not good-looking." All of the positive attributes reported for the cigarette ad images also were described as positive attributes for the students' ideal self-images.

Uutela et al. (unpublished data) compared how children in Los Angeles and Helsinki perceived advertisements for cigarettes, beer, liquor, and cars. Although Finland does not permit advertising for either tobacco or liquor, the authors noted that Camel boot ads were allowed in the country, as were ads for the Philip Morris Company depicting the Marlboro cowboy. A total of 592 Los Angeles students and 660 Helsinki students between the ages of 8 and 17 years were asked the open-ended question, "What kinds of pictures come to your mind when you think of how a cigarette/beer/liquor/car ad might look?" Their responses were coded into 11 categories.

In Los Angeles, the dominant ad images reported for cigarettes, beer, and liquor all were images of "happy/fun/partying," whereas the ad images for cars were more likely to be in the "outdoors/sports" category. In Helsinki, however, the dominant ad images reported for cigarettes and for beer were "tough/macho," for liquor, "rich/status/success," and for cars, "glamorous/sexy/attractive." The authors concluded that young people in Helsinki perceived cigarette advertising as portraying themes that represent the "traditional man's role," whereas the perceived themes in Los Angeles were less gender specific. Finland is one of the few western countries where smoking continues to be significantly higher among boys than among girls.

Humor in Advertising

Nelson and White (1992) provided evidence for the role of humor in advertisements that appealed to youth in a study of 7,047 students aged 11 through 16 years old from 10 schools in the north, south, and midlands of England. Students first were asked two open-ended questions: "What is your favorite advertisement?" and "Why do you like it?" Ninety-one percent of the students reported a favorite ad; 53 percent of these students reported that humor was their main reason for liking their favorite advertisements. Boys (especially those 13 through 16 years old) were significantly more likely than girls to choose an ad because of its humor. Girls (especially those 15 and 16 years old) were more likely than boys to say they liked the personality appearing in their favorite ad. Children who chose ads for alcohol and tobacco products as their favorites were more likely than other respondents to cite humor as their reason for preferring these ads. Several research studies have demonstrated that adults, as well as children, prefer advertisements with humor (Gelb and Pickett 1983). Nonetheless, cartoons with talking animals are generally considered to appeal more to children than to adults; Joe Camel and Willy Penguin (the cartoon mascot for Kool) would be highly atypical examples of advertising humor if the ads that feature them were meant only for an adult audience.

Responses to Advertisements for the Camel and Marlboro Brands

A few recent studies (DiFranza et al. 1991; Pierce et al. 1991; McCan 1992) have compared the responses of children and adults to Camel cigarettes' Old Joe campaign. The subjects in the DiFranza et al. (1991) study were 1,055 high school students in grades 9 through 12 from five regions of the United States and 345 subjects 21 years of age and older from Massachusetts. The adult subjects were recruited from drivers renewing their licenses at the department of motor vehicles office. Seven different advertisements from Camel's Old Joe campaign were used as stimuli. In the first ad, clues to the product and brand were masked, and subjects were asked whether they had ever seen the ad and what product and brand were being advertised. They were then shown six other Old Joe ads, one at a time, and asked to rate the appeal of these ads.

The high school students were more likely than adults to recognize and correctly identify Old Joe (98 vs. 73 percent), to think the ads looked "cool" (58 vs. 40 percent), to think the ads were interesting (74 vs. 55 percent), to think that Old Joe is cool (43 vs. 26 percent), and to report that they would like to have Old Joe as a friend (35 vs. 14 percent). Data on brand preference collected from the high school students who smoked were compared with corresponding data from seven surveys completed before the kick-off of the Old Joe campaign early in 1988. The authors reported that in the three-year duration of the Old Joe campaign, the proportion of smokers under 18 years old who preferred Camel cigarettes over other brands rose from 0.5 percent to 33 percent.

Pierce et al. (1991) analyzed data from the California Tobacco Survey, a 1990 random-digit-dialed telephone survey of 24,296 adults aged 18 and over and 5,040 adolescents aged 12 through 17. Respondents were asked to "think back to the cigarette advertisements . . . recently seen on billboards or in magazines. What brand of cigarette was advertised the most?" Thirty-four percent of the adults named Marlboro as the most-advertised brand; 14 percent of the adults named Camel cigarettes. Among the adolescents, 42 percent identified Marlboro and 30 percent identified Camel as the most advertised brand. No more than 3 percent of either the adult or teenage respondents named any other single brand.

The percentage of respondents who named Marlboro increased with age among the adolescents, peaking at 48 percent among 16- and 17-year-olds before declining among adults. The percentage of respondents who named Camel was inversely related to age, ranging from 23 percent for 16- and 17-year-olds, to 20 percent for 18- through 24-year-olds, to 10 percent for respondents aged 45 years and older. Similar results were found by Pierce et al. (1993) and by a Gallup (1992) survey, although Camel advertisements were identified as the most pervasive ads according to McCan's (1992) analysis of the 1992 California Tobacco Survey. It is not surprising, given these results, that Marlboro and Camel cigarettes are used by up to 70 percent of adolescent smokers (Gallup 1992; CDC 1992).

A study conducted by Fischer et al. (1991) suggested that even very young children were aware of the Joe Camel campaign. In this study, three- through six-year-old children were asked to match each of 22 brand logos on cards to one of 12 products pictured on a game board. Ten of the logos were from children's products, seven from adult products, and five from cigarette brands. The recognition rate for Old Joe ranged from 30 percent for three-year-olds to 91 percent for six-year-olds. By the age of six, the face of Old Joe and the silhouette of Mickey Mouse (the logo for the Disney Channel on cable television) were equally well recognized.

Young People's Self-Image and Implications for Tobacco Use

Intention to smoke is one of the strongest predictors of trying cigarettes and of becoming a smoker (Conrad, Flay, Hill 1992). Chassin et al. (1981) found that 9th- and 10th-grade students whose reported image of smokers correlated with their reported self-image, ideal-date image, and certain attributes of ideal self-image were likely to report that they intended to smoke. The attributes of ideal self-image that correlated with attributes of smokers' image were "tough," "foolish," "act big," "disobedient," and "interested in the opposite sex." A positive relationship of self-image and ideal-date image with smokers' image was also found to differentiate students who were already smokers from nonsmokers. Bowen et al. (1991) found that even among preadolescent, fifth-grade boys, reported images of smokers were more likely to match advertising images of smokers among those who had tried a cigarette than among those who had never tried cigarettes.

Barton et al. (1982) asked 6th- and 10th-grade students to evaluate slides of peer models posed with and without cigarettes. Children in both age groups rated smoking models as being less healthy, more foolish, tougher, poorer at schoolwork, more sociable, more ostentatious, and more disobedient than nonsmoking models. Grube et al. (1984) subsequently reported that both smokers and youth who intended to smoke were more likely than nonsmokers to have self-images like the images they attributed to smokers. McCarthy and Gritz (1984) found that among 6th-, 9th-, and 12th-grade boys and among 12th-grade girls, a correlation of ideal self-image to advertising images of smokers was associated with intentions to smoke.

Students in 11 seventh-grade classes in a working-class area of Pasadena participated in a study (Burton et al. 1989) that investigated attributes of four categories of images: self, ideal self, smoker, and cigarette ad. A random sample of 122 students were asked to use a six-point scale to rate four attributes (healthy, wise, tough, and interested in the opposite sex) in responding to four questions: (1) "What sort of person are you?"; (2) "What sort of person would you like to be?"; (3) "What sort of person is a smoker?"; and (4) "In billboards, magazines and other advertisements, smokers are made out to be what?" Intention to smoke was assessed by the question, "Do you think you will ever smoke cigarettes in the future?" to which there were six possible responses.

Subjects who had small differences between their self-image and their image of smokers, and those who had large differences between their self-image and their ideal self-image, were found to have greater intentions to smoke. These findings can bear closer scrutiny. Smokers' images received relatively low scores from all students, but to a lesser extent among students who had greater intentions to smoke. Since these students had also assigned themselves lower self-images than their peers, they were that much closer to the image scores they assigned to smokers. Also worth elaborating is the observed relationship between greater intention to smoke and greater disparity between self-image and ideal self-image: students intending to smoke assigned themselves lower scores for both images than did their peers. The authors conclude that youth with relatively low self-concepts who do not perceive themselves as being particularly healthy, wise, tough, or interested in the opposite sex may be drawn to smoking as a way of enhancing their low self-image, especially since smoking has been consistently associated with these attributes in advertising.

In a study conducted in 1991 (Burton, Moinuddin, Grenier, unpublished data), 239 black and white seventh- and eighth-grade students in Chicago were asked to rate on a five-point scale their self-image and their ideal self-image according to 13 attributes. Some attributes (such as "special" and "important") were prominent in both scales; other attributes that were highly rated in one image scale were much lower in the other. The attributes that revealed the largest discrepancies between ideal self-image and self-image were "good-looking," "sexy," "tough," and "athletic." The same students were also asked to indicate on a three-point scale how much they would want to buy a given product. When responses to the two sets of questions were compared, having "sexy" as an ideal self-image attribute was associated with expressing an intention to purchase Camel cigarettes, and having "tough" as an ideal self-image attribute was associated with expressing an intention to purchase Marlboro cigarettes.

The image attributions of adolescents described in this set of studies suggests a mechanism of smoking initiation (Figure 3). The visual images in advertisements may thus serve to shape the ideal self-image of this impressionable audience, since the ads may portray attributes that children and adolescents would like to have. The greater the discrepancy between their self-images and their ideal self-images, the more likely these young people are to try to make their self-images more like their ideal self-images (e.g., by "buying into" an improved self-image through responding with the purchase invited by the ads).

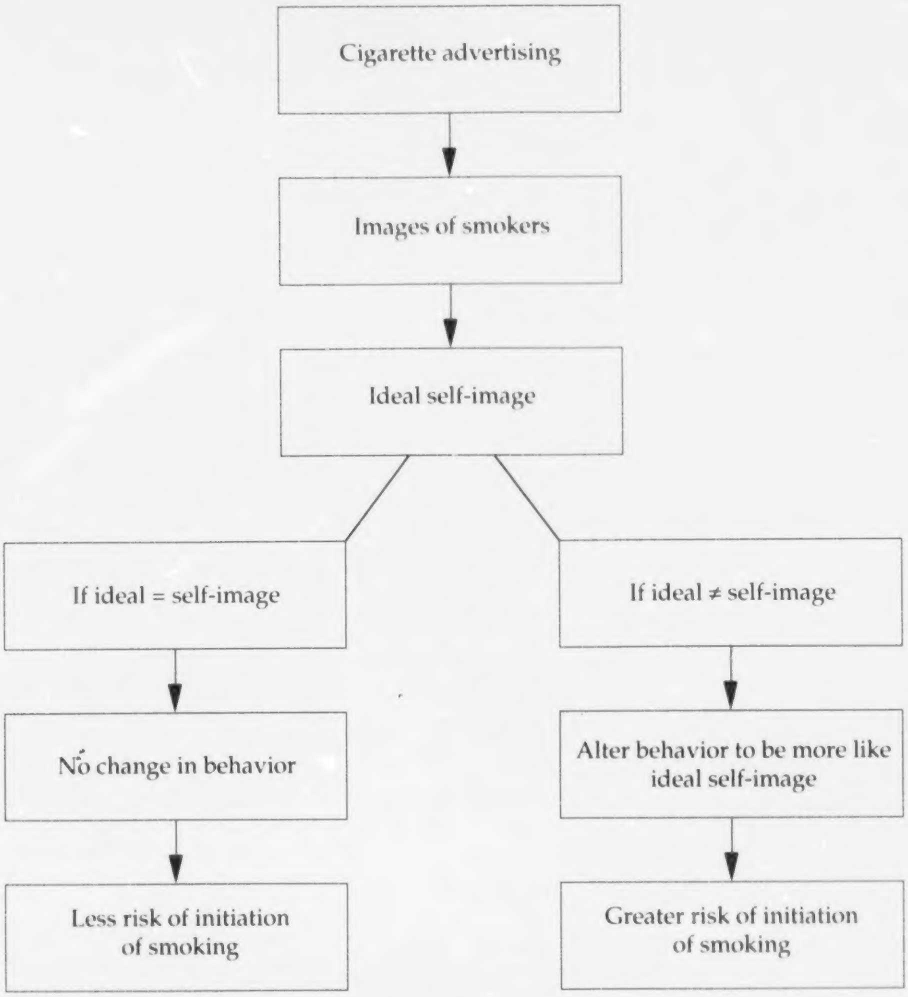
In commercial advertising theory, this notion informs imagery-advertising conceptualization, which presumes that the need for consistency or balance will motivate an individual to try to close the gap between self-image and ideal self-image (McGuire 1989). This con-ceptualization entails an active striving to make the self-image more like the ideal self-image, and not the other way around. Imagery-advertising conceptualization is most compatible with identification theories (e.g., role theories, reference-group theories, and self-presentation theories) that stress the need to expand identity by adopting distinctive thoughts, feelings, or actions (McGuire 1989). Thus, the teenaged girl who responds to a Virginia Slims advertisement that portrays independence is motivated to buy and use the product in order to enhance her sense of independence.

Young People's Misperceptions of Smoking Prevalence and Implications for Tobacco Use

In contrast to the image-advertising model described above, the model in Figure 4 is not concerned with the content of cigarette advertisements, but instead with the pervasiveness of the ads. According to this conceptualization, the pervasiveness of cigarette ads leads youth to overestimate the prevalence of smoking and to consider smoking as normative. Studies have consistently reported that adolescents overestimate the prevalence of cigarette smoking (Johnson 1982; Chassin et al. 1984); moreover, those who smoke overestimate smoking prevalence to a greater extent than do nonsmokers (Sherman et al. 1983; McCarthy and Gritz 1984). Overestimating smoking prevalence has been found to be among the strongest predictors of smoking initiation and acquisition (Chassin et al. 1984; Collins et al. 1987; Sussman et al. 1988; see "Perceived Environmental Factors" for smoking in Chapter 4).

Burton et al. (unpublished data) examined the relationships among cigarette advertising, estimates of smoking prevalence, and intentions to smoke. Children in Helsinki, Finland, where there has been a total tobacco advertising ban since 1978, were compared with children in Los Angeles, where tobacco is advertised in various print media and through promotional activities. Because the Finnish children may have been exposed to tobacco advertising through foreign magazines or through traveling to other countries, the study is characterized as comparing pervasive vs. occasional exposure to advertising. Classroom samples of 477 Helsinki students and 453 Los Angeles students—aged 8 through 14 years in both samples—whose lifetime cigarette use consisted of

Figure 3. **A model of smoking initiation: cigarette advertising as a shaping force of an adolescent's ideal self-image**


Cigarette advertising
Images of smokers
Ideal self-image
If ideal = self-image
If ideal ≠ self-image
No change in behavior
Alter behavior to be more like ideal self-image
Less risk of initiation of smoking
Greater risk of initiation of smoking

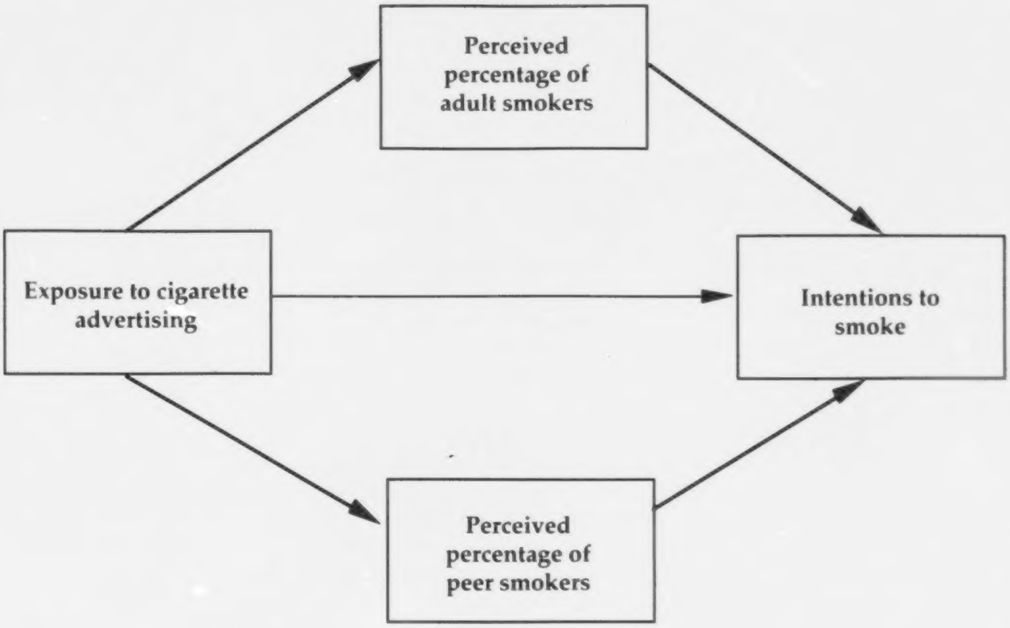
Source: Burton, Moinuddin, Grenier (unpublished data).

no more than a puff of a cigarette were asked how many of their peers and how many adults smoked. Respondents were also asked whether they had ever seen a cigarette ad and when an ad was last seen.

Los Angeles youth were more likely than Helsinki youth to overestimate the prevalence of peer smoking (a 417 percent overestimate vs. a 150 percent one) and of adult smoking (319 percent vs. 173 percent). Both between countries and within the Los Angeles respondents, reported cigarette advertising exposure was positively related to the amount of overestimation of both adult and peer smoking prevalence. Overestimates of smoking prevalence were found to be positively related to intentions to smoke. Interestingly, self-reported exposure to cigarette advertising and intentions to smoke had a direct relationship beyond that mediated by misperceptions of smoking prevalence.

In a recently published study of seventh- and eighth-graders, Botvin et al. (1993) found that exposure to cigarette advertising in periodicals and newspapers was predictive of current smoking status. Adolescents with high exposure to cigarette advertising were significantly

Figure 4. A model of smoking initiation: effect of cigarette advertising on perceptions of smoking prevalence among adults and peers


Perceived percentage of adult smokers
Exposure to cigarette advertising
Intentions to smoke
Perceived percentage of peer smokers

Source: Burton et al. (unpublished data).

more likely to be current, past-day, past-week, or past-month smokers than were those with low exposure to cigarette advertising. Significant associations were also found between exposure to cigarette advertising and students' estimates of smoking prevalence among their peers and among adults.

Studies have been equivocal concerning the relative importance of overestimates of peer smoking compared with overestimates of adult smoking. The general interpretation is that normative influences are operative in both cases; that is, smoking is more or less misperceived to be a usual and appropriate behavior. It also has been suggested that overestimates of adult smoking serve to increase the symbolism of smoking as a desired, adult behavior; smoking therefore acquires greater meaning to an adolescent in transition to adulthood.

Discussion

Even though the tobacco industry asserts that the sole purpose of advertising and promotional activities is to maintain and potentially increase market shares of adult consumers, it appears that some young people are recruited to smoking by brand advertising. Two sources of epidemiologic data support this assertion. Adolescents consistently smoke the most advertised brands of cigarettes, both in the United States and elsewhere (McCarthy and Gritz 1984; Baker et al. 1987; DiFranza et al. 1991). Moreover, following the introduction of advertisements that appeal to young people, the prevalence of use of those brands—or even the prevalence of smoking altogether—increases. This association was seen among adolescent females after the 1968 introduction of the Virginia Slims brand; smoking prevalence among adolescent females nearly doubled between 1968 (8 percent) and 1974 (15 percent) (USDHHS 1980). A similar associated increase was seen for smokeless tobacco use among adolescent males after a major advertising and promotional campaign in the 1970s focused on "beginners" (Tye, Warner, Glantz 1987). More recently, Camel's Old Joe advertising campaign appears to have substantially increased the brand's market share among persons less than 18 years old (DiFranza et al. 1991).

Advertising and promotional activities also appear to influence risk factors for adolescent tobacco use, even if this is not the intention of the tobacco industry. These psychosocial risk factors—having a low self-image, attributing positive meanings or benefits to smoking, and perceiving smoking as prevalent and normative—strongly predict smoking intentions and smoking onset.

In several countries, concern about the health consequences of smoking and the potential influence of advertising on consumption has prompted a nationwide ban on tobacco advertising (UK Department of Health 1992). In 1975, Norway banned all tobacco advertising, sponsorship, and indirect tobacco advertising. In 1977, Finland banned all forms of tobacco advertising. Canada introduced a ban in 1989 on all tobacco advertising, sponsorship, and indirect advertising of Canadian origin. New Zealand introduced a ban in December 1990 on advertising in print media originating in New Zealand, on advertising in posters, and on sponsorship of sports. Although the bans in Canada and New Zealand have been relatively recent, the current evidence indicates that these actions have had a significant effect on consumption in each of the four countries (UK Department of Health 1992). In each case, the banning of advertising was followed by a decrease in smoking rates that persisted even when controlled by changes in other factors, such as price. These studies focused on total cigarette consumption; although the bans appear to have influenced smoking rates among young people in Canada and Norway, more specific data concerning young people are forthcoming.

Conclusions

1. Young people continue to be a strategically important market for the tobacco industry.
2. Young people are currently exposed to cigarette messages through print media (including outdoor billboards) and through promotional activities, such as sponsorship of sporting events and public entertainment, point-of-sale displays, and distribution of specialty items.
3. Cigarette advertising uses images rather than information to portray the attractiveness and function of smoking. Human models and cartoon characters in cigarette advertising convey independence, healthfulness, adventure-seeking, and youthful activities—themes correlated with psychosocial factors that appeal to young people.
4. Cigarette advertisements capitalize on the disparity between an ideal and actual self-image and imply that smoking may close the gap.
5. Cigarette advertising appears to affect young people's perceptions of the pervasiveness, image, and function of smoking. Since misperceptions in these areas constitute psychosocial risk factors for the initiation of smoking, cigarette advertising appears to increase young people's risk of smoking.

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Chapter 6
Efforts to Prevent Tobacco Use Among Young People

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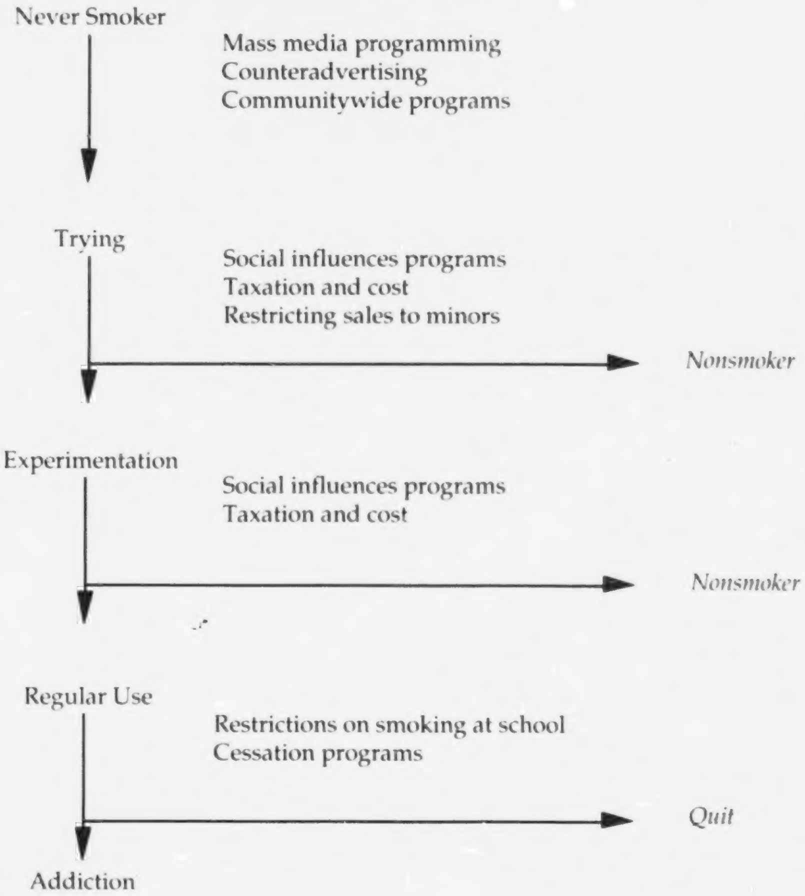
Introduction

This chapter examines the range and effectiveness of efforts to prevent tobacco use among young people. The first section provides data on recent public opinion of strategies to reduce tobacco use among young people. The second set of sections focuses on educational efforts to reduce cigarette smoking and smokeless tobacco use among young people, including school-based, clinic, and communitywide programs. The third set of sections examines the impact of social conditions and public policies, including the effects of mass media programming, legal restrictions, warning labels, and tobacco taxation. Together, these efforts can inoculate against the psychosocial risk factors discussed in Chapters 4 and 5, as shown in Figure 1.

Figure 1. Efforts to prevent tobacco use among young people, by stage of initiation


Never Smoker
Mass media programming
Counteradvertising
Communitywide programs
Trying
Social influences programs
Taxation and cost
Restricting sales to minors
Nonsmoker
Experimentation
Social influences programs
Taxation and cost
Nonsmoker
Regular Use
Restrictions on smoking at school
Cessation programs
Quit
Addiction

Source: Adapted from U.S. Department of Health and Human Services (1991).

Public Opinion About Preventing Tobacco Use Among Young People

Introduction

The information in this section is derived from several different sources, including national surveys conducted by the federal government and by private organizations (e.g., the Gallup Organization, Louis Harris and Associates), statewide surveys conducted by government agencies or private organizations (e.g., the American Cancer Society [ACS]), and community-based surveys. A remarkably consistent pattern emerges regarding public opinion of tobacco-control policies. First, both smokers and nonsmokers express much greater support for policies to prevent youth from smoking than for policies to discourage adult smoking. A second finding is that nonsmokers are consistently more supportive of government efforts to regulate tobacco than are smokers.

Public Opinion About Tobacco Education

Historically, public support for efforts to keep children from smoking has been stronger than support for efforts to reduce smoking among adults. During the first half of this century, most states instituted laws that prohibited the sale or gift of cigarettes to minors (Hawkins 1964), since tobacco use was viewed as an adult behavior and children were seen as a group to be protected from potentially harmful substances. However, as the health dangers of smoking became known, the public looked to schools to do more to educate children about the hazards of tobacco use. For example, a 1957 national survey of adults (N = 1,541) conducted by the Gallup Organization (1957) found that 68 percent of respondents believed that the danger from smoking was great enough to warrant literature being distributed to schoolchildren to warn them of these dangers. Fifty-three percent of the respondents also felt that the danger was sufficient to warrant an announcement from the federal government (presumably, to adult smokers) regarding the danger of smoking.

Traditionally, public and private efforts to reduce the initiation of smoking by children have involved schools (U.S. Department of Health and Human Services [USDHHS] 1989). A number of states have enacted laws that mandate education about smoking and health in schools. In part, the emphasis on school-based education reflects a belief that education is the most effective way to discourage children from smoking. A 1984 national survey of adults sponsored by the American Board of Family Practice (Research and Forecasts, Inc. 1985) asked respondents to indicate what approaches they believed were effective in discouraging smoking. The highest-rated approach, mentioned by 81 percent of those surveyed (N = 1,007), was providing smoking-related education to children in grade school. The use of public service campaigns, television shows, and other media to motivate teenagers not to smoke was mentioned by 66 percent of respondents. Twenty-one percent felt that legally banning the use of tobacco would be effective.

There is strong public support for tobacco education efforts in the schools. The 1989 Smoking Activity Volunteer-Executed Survey (SAVES), which was administered to adults in four states (Arizona, Michigan, Pennsylvania, and Texas), collected information on a wide range of issues relevant to policies concerning smoking (Marcus et al., in press). Trained and supervised ACS volunteers used standardized questionnaires to conduct telephone interviews of the sampled adults. Data collected in this survey found that a high proportion of the respondents (87 to 91 percent) agreed with the statement, "There should be a strong tobacco education program in the school system" (Marcus et al., in press). Only a minority of these respondents (13 to 33 percent) agreed with the statement, "Currently, schools are doing enough to prevent children from starting to use tobacco." This finding is consistent with the results of a 1990 telephone survey of California adults, in which 74 percent of respondents felt that antitobacco education in schools should be increased (California Department of Health Services 1991).

Restrictions on Smoking in Schools

Traditionally, even secondary schools that prohibit smoking by students have allowed teachers and staff to smoke in designated areas away from students (USDHHS 1989). This double standard reflects public opinion about restricting smoking in school settings. A 1987 telephone survey of adults in Minnesota (Forster et al. 1991) found strong support (93 percent) for a policy prohibiting students from smoking in school, and a smaller percentage (77 percent) favored a ban on smoking among teachers and staff. School smoking policies, like those for other workplaces, have become more restrictive in recent years. Several states and many communities have enacted laws that completely ban or severely restrict smoking in schools and on school property (Coalition on Smoking OR Health 1992). These laws are discussed later in this chapter.

The 1989 Surgeon General's report on smoking and health (USDHHS 1989) clearly documented the trend of Americans to increasingly support restrictions on smoking in a wide range of public locations, such as restaurants, worksites, and schools. In general, surveys that ask about limiting smoking in various settings have found that support for such restrictions in schools is usually stronger than for other locations. For example, findings from a telephone survey for the 1989 National Cancer Institute (NCI) Community Intervention Trial for Smoking Cessation (COMMIT) (Centers for Disease Control [CDC] 1991a) revealed that fewer than one-quarter of adult respondents in 10 U.S. intervention communities supported a complete ban on smoking in private worksites and restaurants, whereas over half endorsed a ban on smoking on school grounds. Support for banning smoking in secondary schools possibly reflects the broad societal belief that schools have an important role to play in discouraging tobacco use by children.

Restrictions on Tobacco Advertising and Promotion

Numerous national, state, and local surveys have tried to assess public opinion about restrictions on tobacco product advertising. In a series of national Gallup surveys (Gallup Organization 1978, 1987, 1988, 1991, 1993) conducted between 1977 and 1993, support for a complete ban on cigarette advertising increased from 36 to 53 percent. The 1989 COMMIT survey (CDC 1991a) of a representative sample of 300 to 400 adults 25 to 64 years old in each of 10 intervention communities in 9 states found that between one-half and three-quarters agreed with the statement, "All tobacco advertising should be eliminated."

Some surveys have asked about limiting specific types of tobacco advertising (e.g., billboards, newspapers, magazines) and promotional practices (e.g., distribution of free tobacco samples, tobacco company sponsorship of sporting and cultural events) (Table 1). A 1987 telephone survey (Forster et al. 1991) of 821 adults from seven Minnesota communities asked respondents to indicate their support for restrictions on various forms of advertising. Seventy-three percent of respondents favored a ban on tobacco signs and billboards; 70 percent supported a ban on tobacco advertising in newspapers and magazines. The ACS-sponsored 1989 SAVES survey of four states found that support for a ban on cigarette advertising in newspapers, in magazines, and on billboards ranged from 61 to 69 percent (Marcus et al., in press). Over three-quarters of respondents in this survey agreed with the statement, "Tobacco companies should be prohibited from distributing free tobacco samples on public property or through the mail." Comparable results were obtained in a 1990 telephone survey of adults in California (California Department of Health Services 1991). Fifty-four percent of respondents in this survey supported a ban on tobacco ads on outdoor billboards; 49 percent supported a ban on tobacco ads in newspapers and magazines; 67 percent supported a ban on the distribution of free tobacco samples or coupons to obtain free samples by mail; and 75 percent supported a ban on the distribution of free tobacco samples on public property.

Three surveys (California Department of Health Services 1991; CDC 1991a; Marcus et al., in press) have measured public opinion about tobacco company sponsorship of sporting and cultural events (Table 1). In the 1989 COMMIT survey (CDC 1991a) of 10 communities, from one-third to more than one-half of respondents supported a ban on such sponsorship. The 1989 SAVES survey (Marcus et al., in press) found that about one-half of respondents agreed with the statement, "Tobacco companies should be prohibited from sponsoring sports events or advertising their products at these events." Fifty-two percent of respondents in the aforementioned 1990 California survey (California Department of Health Services 1991) believed that sponsorship of sporting or cultural events by tobacco companies should be banned. In all three surveys, support for a ban on tobacco company sponsorship of sporting and cultural events was about twice as strong among nonsmokers as it was among smokers.

The function and effect of tobacco advertising have been the subject of much controversy and debate among scientists and within the tobacco industry. The tobacco industry has argued that advertising targets adults only and encourages regular smokers to switch brands or to maintain brand loyalty (Tobacco Institute 1964; see "The 'Maturity' of the Cigarette Market" in Chapter 5). Many health experts assert that tobacco advertising targets children to encourage them to start using tobacco (Tye 1987; DiFranza et al. 1991; Fischer et al. 1991; Pierce et al. 1991; CDC 1992a). In fact, a major newspaper, the *Seattle Times*, voluntarily discontinued tobacco advertising in June 1993, citing "growing medical evidence on the dangers of smoking, as well as tobacco advertisers' recent targeting of youth and racial minorities" (Nogaki and Gupta 1993, p. E1). Legislative proposals to restrict or prohibit tobacco advertising are often presented as a means of protecting children (Myers and Hollar 1989). In 1986, about half of the respondents to the Adult Use of Tobacco Survey (AUTS) (USDHHS 1990c) agreed with the statement, "If cigarettes were not advertised anywhere, fewer young people would start smoking." In July 1990, a national Gallup survey (Gallup Organization 1990c) of adults found that more respondents (49 percent) thought that advertising and promotion paid for by the tobacco companies represented an active attempt to get teenagers and young people to start smoking than believed that such efforts were to encourage brand switching among people who already smoke (38 percent).

Table 1. Public opinion about restricting or banning different types of tobacco advertising and promotions, United States, 1987–1991

Source and year of survey	Description of survey	Questions or statements	Responses
University of Minnesota 1987 (Forster et al. 1991)	Telephone survey of a random sample of adults (aged 18–74 years) in seven communities in Minnesota (N = 821)	Do you favor or oppose prohibiting tobacco signs and billboards?	73% favored a prohibition
		Do you favor or oppose prohibiting tobacco advertising in magazines and newspapers?	70% favored a prohibition
American Cancer Society 1989 (Marcus et al., in press)	Telephone survey of a random sample of adults (aged ≥ 18 years) in four states: Arizona (N = 294), Pennsylvania (N = 291), Texas (N = 303), and Michigan (N = 98)	Advertising of cigarettes should be banned in newspapers, magazines, and outdoor posters or billboards.	Agreement across the four states sampled: 61%–69%
		Tobacco companies should be prohibited from distributing free tobacco samples on public property or through the mail.	73%–81%
		Tobacco companies should be prohibited from sponsoring sports events or advertising their products at these events.	49%–59%
National Cancer Institute 1989 (Centers for Disease Control 1991b)	Telephone survey of a random sample of 300 to 400 adults (aged 25–64 years) in each of 10 U.S. COMMIT* intervention communities	Tobacco companies should not be allowed to sponsor sporting and cultural events.	Agreement across the 10 communities sampled: 31%–56%
California Department of Health Services 1990 (California Department of Health Services 1991)	Telephone survey of a random sample of adults (aged ≥ 18 years) in California (N = 6,600)	Do you think advertising of tobacco products on outdoor billboards should be allowed or banned?	54% favored a ban (42% smokers; 62% nonsmokers)
		Do you think advertising of tobacco products through newspapers and magazines should be allowed or banned?	49% favored a ban (38% smokers; 57% nonsmokers)
		Do you think sponsorship of sporting or cultural events by tobacco companies should be allowed or banned?	52% favored a ban (39% smokers; 61% nonsmokers)
		Do you think that distribution of free cigarettes and tobacco products on public property should be allowed or banned?	75% favored a ban (62% smokers; 84% nonsmokers)
		Do you think that distribution of free tobacco samples or coupons to obtain free samples by *mail* should be allowed or banned?	67% favored a ban (52% smokers; 78% nonsmokers)

*COMMIT = Community Intervention Trial for Smoking Cessation.

Data collected in a 1992 national telephone poll (N = 1,200) of adults (Louis Harris and Associates 1992) suggest that a predominant belief in the individual's right to smoke coexists with a less predominant concern about the persuasive power of tobacco advertising. An overwhelming majority (87 percent) of respondents agreed with the proposition that "to smoke or not to smoke is a personal decision that adults should be free to make for themselves." On the other hand, 68 percent favored a ban on tobacco ads in newspapers, in magazines, and on billboards; 73 percent said they would support an initiative to require stronger warning labels on cigarette packages; and 83 percent would favor legislation banning tobacco ads targeted at teenagers. Three-quarters of smokers themselves supported a ban on tobacco ads targeted at teenagers. The survey report concludes that "even smokers see smoking as something to be discouraged, especially where teenagers are concerned" (p. 39).

Restrictions on the Sale of Tobacco Products to Minors

Public opinion strongly favors measures to discourage tobacco sales to minors (persons under the age of 18). A 1962 national Gallup personal interview survey (Gallup Organization 1962) found that 79 percent of adults supported the idea that there should be a law against selling cigarettes to people under 16 years old. According to the 1964 AUTS (U.S. Department of Health, Education, and Welfare [USDHEW] 1969), only 9 percent of adults thought that sales of cigarettes to young people under a certain age should not be against the law. Today, all states have laws prohibiting the sale of cigarettes to persons under 18 years old (CDC, OSH, unpublished data).

On July 10, 1992, Congress passed Public Law 102-321, the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) Reorganization Act, which contained Section 1926, providing for the enforcement of minors' access legislation in all states receiving funding for the prevention and treatment of substance abuse. These provisions required funded states to enforce legislation prohibiting the sale or distribution of tobacco products to individuals under the age of 18. Enforcement included yearly random, unannounced inspections as well as annual reports to the Secretary of Health and Human Services describing the state's enforcement activities for that year, the extent of success in reducing the availability of tobacco to children under 18, and enforcement strategies to be used in the next year for which funding was being sought. By June 1993, 49 states and the District of Columbia had passed legislation in compliance with Section 1926, prohibiting the sales and distribution of tobacco products to children under the age of 18. (Virginia restrictions applied only to sales of tobacco products.)

Most people do not believe that laws prohibiting the sale of tobacco to minors are adequately enforced, and the overwhelming majority of both smokers and nonsmokers support stronger measures to limit minors' access to tobacco. The 1989 SAVES (Marcus et al., in press) found that 8 out of 10 adults felt it was "very easy" or "somewhat easy" for teenagers to buy cigarettes near where they live (see "Factors That Influence Tobacco Acceptability and Availability" in Chapter 4). The overwhelming majority of respondents to this survey (86 to 92 percent) felt that there should be better enforcement of existing laws banning the sale of tobacco to minors, and most (83 to 88 percent) endorsed the idea that the laws should be strengthened. Results of a 1990 survey of California adults (California Department of Health Services 1991) provide a similar picture; 76 percent responded negatively when asked, "Do you think the laws banning the sale of tobacco products to minors have been adequately enforced?"

Several different surveys have tried to assess public opinion regarding specific types of legislative actions (e.g., licensing retailers and banning cigarette vending machines) to prevent minors' access to tobacco (Table 2). A 1987 survey of adults in Minnesota (Forster et al. 1991) found that 75 percent favored a policy whereby retailers would lose their tobacco licenses if they sold cigarettes to minors. Two-thirds of adult participants in the 1989 COMMIT survey (CDC 1991a) agreed with the statement, "Tobacco products should be as strictly controlled as alcohol products." The majority of respondents in this survey (from 77 to 93 percent) also agreed with the statement, "Merchants who sell tobacco to minors should be fined."

The 1989 SAVES (Marcus et al., in press) asked respondents in four states if they thought the sale of cigarettes through vending machines should be banned. Overall, between 60 and 68 percent of respondents favored a ban on cigarette vending machines; smokers were much less likely than nonsmokers to support a ban (42 to 58 percent vs. 66 to 72 percent). The 1987 Minnesota survey (Forster et al. 1991) found that 57 percent of adults supported a policy eliminating all cigarette vending machines; 80 percent favored a policy banning vending machines in locations where teenagers gather. In the 1990 California survey (California Department of Health Services 1991), a majority of both smokers (74 percent) and nonsmokers (87 percent) favored the idea of banning cigarette vending machines that are accessible to minors. A similar result was found in the 1989 COMMIT survey (CDC 1991a), where between 76 and 89 percent of adults agreed with the statement, "Cigarette vending

Table 2. Public opinion about different legislative actions to prevent minors' access to tobacco, United States, 1987–1991

Source and year of survey	Description of survey	Questions or statements	Responses
University of Minnesota 1987 (Forster et al. 1991)	Telephone survey of a random sample of adults (aged 18–74 years) in seven communities in Minnesota (N = 821)	Do you favor or oppose suspending a retailer's tobacco license for sale to minors?	75% favored suspending the license
		Do you favor or oppose eliminating all cigarette vending machines?	57% favored eliminating the machines
		Do you favor or oppose eliminating cigarette vending machines where teenagers gather?	80% favored eliminating the machines
American Cancer Society 1989 (Marcus et al., in press)	Telephone survey of a random sample of adults (aged ≥ 18 years) in four states: Arizona (N = 294), Pennsylvania (N = 291), Texas (N = 303), and Michigan (N = 98)	Do you think there should be laws to ban the sale of cigarettes through vending machines?	Support for a ban across the four states sampled: 60%–68%
National Cancer Institute 1989 (Centers for Disease Control 1991b)	Telephone survey of a random sample of 300 to 400 adults (aged 25–64 years) in each of 10 U.S. COMMIT* intervention communities	Tobacco products should be as strictly controlled as alcohol products.	Agreement across the 10 communities sampled: 51%–75%
		Merchants who sell tobacco to minors should be fined.	77%–93%
		Cigarette vending machines should be eliminated in places where teens gather.	76%–89%
California Department of Health Services (California Department of Health Services 1991)	Telephone survey of a random sample of adults (aged ≥ 18 years) in California (N = 6,600)	Do you think cigarette vending machines that are accessible to minors should be allowed or banned?	82% favored a ban (74% smokers; 87% nonsmokers)

*COMMIT = Community Intervention Trial for Smoking Cessation.

machines should be eliminated in places where teens gather."

Taxes on Tobacco Products

Public opinion surveys consistently show that most people would support an increase in tobacco taxes over other taxes (such as income tax, sales tax, or gasoline tax) (Gallup Organization 1989, 1990a, 1993; Hart Research Associates and Robert Teeter 1990a, b, c; Yankelovich, Clancy, Shulman 1990a, b; ACS 1992; Kleine 1993). Surveys conducted between 1989 and 1993 show strong support for raising taxes on tobacco and alcohol as a way of reducing the federal budget deficit or to pay for health care reform (Toner 1993) (Table 3).

Support for raising tobacco taxes tends to increase when tax revenue is earmarked for specific purposes, especially for health and educational programs (Gallup Organization 1993), such as those aimed at preventing children from smoking or from using drugs. A 1989 national survey sponsored by the Associated Press (Associated Press/Media General 1989) found that 75 percent of adults supported increasing the federal excise tax on cigarettes to pay for an expanded federal antidrug program. The same questions asked in 1990 found that 77 percent supported raising cigarette taxes (Associated Press/Media General 1990). The 1989 SAVES (Marcus et al., in press) found that about two-thirds of adults favored using an extra tax on tobacco to cover the cost of

Table 3. Public opinion about increasing tobacco taxes, United States, 1989–1990

Source and year of survey	Description of survey	Questions	Responses
Gallup Organization 1989	National personal interview survey with 2,048 adults (aged ≥ 18 years)	Taking into account the amount each (tax) would raise, and your opinion about these taxes, which, if any, would you favor as a means of reducing the federal budget deficit?	64% favored raising cigarette taxes by 16 cents per pack; the only other tax measure mentioned more frequently was raising the tax on alcohol (69%)
Gallup Organization 1990b	National telephone survey of 1,255 adults (aged ≥ 18 years)	If taxes were raised to reduce the deficit, which one of the following would be your first choice to help reduce the deficit?	First choice of largest proportion of respondents (42%) was raising taxes on cigarettes and alcohol
Hart Research Associates and Robert Teeter 1990a, b, c	National telephone survey of a random sample of registered voters (January survey N = 1,510; May survey N = 1,007; July survey N = 1,555)	Let us suppose the government needed to raise taxes. Do you favor or oppose raising alcohol and tobacco taxes?	January 1990: 78% favor May 1990: 83% favor July 1990: 78% favor
Yankelovich, Clancy, Shulman 1990a, b	National telephone survey of adults (aged ≥ 18 years) (May survey N = 1,000; October survey N = 500)	Do you favor or oppose raising taxes on cigarettes to reduce the federal budget deficit?	May 1990: 72% favor October 1990: 71% favor
Associated Press/Media General 1989, 1990	National telephone survey of adults (aged ≥ 18 years) (September 1989 survey N = 1,071; May 1990 survey N = 1,143)	To pay for a bigger federal antidrug program, would you support or oppose higher federal taxes on cigarettes?	September 1989: 75% favor May 1990: 77% favor

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campaigns to reduce smoking. A 1987 national survey sponsored by the American Medical Association (Harvey and Shubat 1987) found that 79 percent of adults favored an increase in the tax on tobacco products if the money from the increase went to Medicare. A 1992 survey of Michigan adults (ACS 1992) found that 72 percent would support raising the state's cigarette excise tax if the additional revenue would be targeted for health care and education. Interestingly, 58 percent of respondents to this survey claimed that they would vote for a candidate who supported the tobacco tax increase, whereas 27 percent would vote for a candidate who opposed the tax increase.

Some relevant information on public opinion regarding tobacco taxes comes from a survey conducted in Canada, where tobacco taxes have increased sharply in the past decade. A December 1990 poll conducted for the Council for Tobacco-Free Ontario (Council for a Tobacco-Free Ontario/Non-Smokers' Rights Association 1992) questioned Ontarians about their support for a substantial increase in the tobacco tax. Overall, 58 percent of Ontarians supported a 50-cent per pack increase in the cigarette tax; this support did not change when respondents were informed that taxes currently accounted for 60 percent of the retail price of cigarettes. However, when respondents were told that higher tobacco prices could prevent children from starting to smoke, support for the tax increase climbed to 67 percent. Support was even higher when respondents were told of different ways to use revenues raised by the new tax, such as reducing the budget deficit (70 percent support), helping people quit smoking (78 percent support), and establishing a fund to help prevent smoking among young people (84 percent support; 77 percent among smokers).

Educational Efforts to Prevent Tobacco Use Among Young People

School-Based Smoking-Prevention Programs

Introduction

Since the 1964 publication of the first Surgeon General's report on smoking and health (Public Health Service [PHS] 1964), smoking prevention has been recognized as a primary strategy for controlling smoking in the general population. The first report identified the difficulty that long-term adult smokers typically experience in their attempts to quit. The report thus advocated programs directed at educating high school and college students about the health hazards of smoking; in theory, school-based programs would interfere with the development of smoking behavior before smoking became firmly established.

When the term "prevention" was applied to health-related issues in the 1960s, however, the concept referred not exclusively to school curricula but also to efforts to disseminate warnings about products and practices that public health professionals considered potential health hazards (Schwartz 1969). The approach to prevention research at that time consisted of biomedical research to establish physiological mechanisms of smoking-related diseases, coupled with epidemiologic research to identify etiologic characteristics of smokers. This research led, when appropriate, to the dissemination of findings and recommendations to the public. A proclamation and direct warning from the U.S. Surgeon General about the life-threatening characteristics of cigarette smoking was expected to convince smokers to quit and nonsmokers to avoid taking up the practice. Had this effect been the case, the concept of smoking prevention might never have amounted to more than "spreading the word" to those segments of the population who had not yet received it. Unfortunately, nearly three decades later and despite monumental efforts to disseminate warnings, cigarette smoking remains the single most preventable cause of death and disease in our society (USDHHS 1989).

This section reviews the evolution of the concept of smoking prevention since the 1960s and identifies avenues for future progress in this area.

Early Approaches to Smoking Education and Prevention

In the 1960s and early 1970s, strategies to prevent the onset of cigarette smoking were often based on the premise that adolescents who engaged in smoking behavior had failed to comprehend the Surgeon General's warnings on the health hazards of smoking (Thompson 1978). The assumption was that these young people had a deficit of information that could be addressed by presenting them with health messages in a manner that caught their attention and provided them with sufficient justification not to smoke. Improvements in knowledge levels, or cognitive factors, would thus lead directly to changes in behavior.

Information Deficit Model

Early prevention programs based on this information deficit model tried to heighten young people's awareness and comprehension of the negative consequences of smoking. Programs based on this model used various educational methods to convey information, including books, pamphlets, posters, films, and lectures (Thompson 1978). Through images and messages often intended to arouse fear, these programs were designed to convince the adolescent audience that persons who smoke risk a variety of serious physical consequences throughout their lives, including an increased likelihood of premature death in adulthood from cardiovascular disease or cancer.

The underlying assumption of these information-focused programs proved to have limited grounding. Although expanded educational efforts in schools throughout the 1970s provided adolescents with various kinds of smoking-related information, this information alone did not deter them from beginning to smoke. Comprehensive reviews published at that time concluded that smoking-prevention programs based on the information deficit approach were not effective (Thompson 1978; Goodstadt 1978). Providing knowledge of the health consequences of smoking is still an important task for public health, but this single strategy is not sufficient to change most young people's behavior.

Affective Education Model

The information deficit model did not take into account the complex relationship between knowledge acquisition and subsequent behavior (nor, as will be discussed later, did it consider the addictive nature of tobacco use). For example, cognitive factors are mediated by different personal variables, including changes in attitudes, beliefs, intentions, and perceived norms (McGuire 1964; Fishbein 1967). To rectify the shortcomings of information-focused interventions, alternative smoking-prevention approaches that evolved during the 1970s tried various forms of motivational or affective education. These approaches, which came to be referred to collectively as the affective education model, were based on the assumption that adolescents smoke cigarettes because their self-perceptions are somehow compatible with a health-compromising behavior like smoking (Durell and Bukoski 1984). Interventions based on the affective model sought to increase adolescents' perceptions of self-worth and to establish or clarify a health-related value system that would support a young person's decision not to smoke.

Another assumption typically made by prevention programs based on the affective education approach was that information specific to tobacco was neither necessary nor sufficient for reducing the onset of cigarette smoking among adolescents (Goodstadt 1978). These affective approaches evolved out of the direct experiences of educators and counselors who had begun to associate cigarette smoking among adolescents with various problem behaviors, including school absenteeism, low achievement motivation, and antisocial behavior. The intervention programs suggested that adolescents who experienced such problems could rectify them through changes in their attitudes toward school, family, or community, if sufficiently motivated to do so.

Reviews based on more than a decade of research have concluded that interventions based on the affective education model were no more effective in reducing adolescent smoking than those based on the information deficit model. Some studies have even suggested (that is, without conclusive findings) that these programs may have had the untoward effect of eliciting interest in the behaviors they attempted to discourage (Kinder, Pape, Walfish 1980; Schaps et al. 1981; Hansen et al. 1988). Nonetheless, affective education programs marked the beginning of an era during which enormous effort was expended to design smoking-prevention interventions that were more directly related to the factors believed to cause smoking among adolescents.

Correlates of Adolescent Smoking Behavior

Evaluations of interventions before the mid-1970s suggested that these approaches were insufficient for several reasons. For example, although high school and college students were the intended targets of smoking-prevention programs in the 1960s and 1970s, the development of smoking behavior follows a series of stages that typically begin earlier in life, when students are in the sixth or seventh grade (Leventhal and Cleary 1980). Such findings suggest that smoking-prevention interventions need to be initiated earlier than high school and that attention should be given to the various stages that adolescent smokers moved through as they developed from nonsmokers into regular smokers (Chassin, Presson, Sherman 1985).

As opposed to the narrow focus of prevention models based solely on information or affective factors, a broader focus and a more diverse set of correlates or antecedents began to emerge as important determinants of adolescent cigarette smoking. As reviewed by Evans (1984), these factors have been studied categorically as sociodemographic, environmental, behavioral, and personal variables. Throughout the 1980s, using data from both longitudinal (McAlister, Krosnick, Milburn 1984) and cross-sectional (Chassin, Presson, Sherman 1984) surveys, researchers developed a clearer understanding of the etiology of smoking behavior.

This research showed that prevention strategies in the 1960s and 1970s had greatly underestimated the extent to which adolescent smoking was determined by social environmental variables. An exception was the early work of the proactive physicians group Doctors Ought to Care (DOC), which argued that tobacco advertising and promotional activities strongly influence the social environment of adolescents (Blum 1980). A detailed overview of the relationships of social environmental variables to the acquisition of smoking behavior is found in Chapter 4 of this report (see "Environmental Factors in the Initiation of Smoking").

As the major risk factors associated with smoking onset were identified, they were translated into new intervention methods, and the programs that resulted were substantially different from the approaches that had preceded them.

Instilling Skills for Resisting Social Influences to Smoke

Prevention research grants from the National Institute on Drug Abuse (NIDA) and the National Institutes of Health (Bell and Levy 1984; USDHHS 1984; Stone 1985; Glynn 1989) were largely responsible for creating a wave of prevention program development from the late 1970s throughout the 1980s. These efforts fundamentally redefined the concept of primary prevention in several ways.

First, programs began to make better use of social, psychological, and behavioral theories as a basis for understanding what approaches might work to modify patterns of smoking onset among adolescents. Program design became far more data driven, as researchers began to design intervention components based directly on findings from theory-based etiologic research on adolescent smoking. This orientation led to an improved understanding and targeting of the determinants and correlates of smoking behavior among adolescents. Much information was published about the characteristics and components of successful smoking-prevention programs. Much of what has been learned focuses particularly on social influences, norms, and skills training and has the objective of attaining behavioral abilities, methods, skills, and techniques (rather than knowledge, beliefs, or motivation) that make it easier to adopt and maintain health-enhancing behavior patterns, such as not smoking. Lastly, the research methodology used to evaluate the efficacy of preventive interventions became far more sophisticated and considerably more rigorous.

Intervention Objectives

This prevention intervention approach recognizes the social environment as the most important determinant of smoking onset and focuses on the development of norms and skills to identify and resist social influences to smoke. Underlying this approach is the assumption that adolescents who smoke may lack specific skills to deal successfully with various social influences that support smoking. Such influences include the misperception that most people smoke, the perceived desirable social image of smoking, the appeal of cigarette advertising and promotional activities, and the persuasive effects of sibling and peer smoking. Although considerable variation can be found across curricula, programs that instill the skills needed to resist such social influences have included a fairly consistent group of components that include training in resisting social pressures (e.g., marketing) and peer pressures to smoke and training that fosters general assertiveness, decision making, and communication skills (Botvin and Wills 1985). These programs also promote healthful normative expectations and particularly correct the misperception that most adolescents smoke.

Earlier programs for adolescents designed their messages to generate fear and anxiety about long-term disease risk. Approaches that teach skills to guard against social influences have assumed that scare tactics based on long-term health risk are not pertinent to the short-term perspective of many adolescents. The principal messages of skills-based intervention have thus focused on the negative, short-term social consequences of smoking, on the techniques of tobacco advertising that may be falsely appealing to adolescents, and on the socially salient advantages of being a nonsmoker.

Overall Program Structure

In 1987, the NCI convened a panel of experts to establish consensus regarding the essential structural elements of effective smoking-prevention programs (USDHHS 1991). The panel agreed that eight features could be considered both necessary and sufficient for effective school-based smoking-prevention programs (Glynn 1989) (Table 4). In a recent meta-analysis (Rooney 1992) of outcomes of research studies conducted from 1974 through 1989 on school-based smoking prevention, the essential elements of the NCI expert panel were examined and mostly supported. This meta-analysis will be discussed later in this chapter.

Most of the successful programs that provide skills for resisting social influences share several major curriculum components. One of these is to convey the short-term negative consequences of cigarette smoking, including social undesirability and physiological impairment. Another component is to have students explore inaccurate normative expectations; students thus learn that cigarette smoking is not a normative behavior for adolescents their age and that the majority of persons in any age group are nonsmokers. Students examine the reasons that adolescents say they smoke, including to be accepted by peers, to appear mature, or to help cope with difficult situations. The factors that affect adolescent smoking can also be explored, including the influence of parents, peers, and mass media; for example, students can learn how role modeling and advertising can falsely establish positive cultural meanings for smoking (see "Research on the Effects of Cigarette Advertising and Promotional Activities on Young People" in Chapter 5). A related component is to engage students in training, modeling, rehearsing, and reinforcing methods that counter these influences and to coach students to communicate these techniques to others. Some approaches also include generic personal and social skills training to promote overall competence and reduce motivations to smoke (Botvin and Wills 1985).

Curriculum Format

Among the numerous approaches to teaching skills to resist social influences to smoke, the format variations are in most cases minor (Best et al. 1988). For example, a number of these approaches rely on classroom teachers to deliver the smoking-prevention program. The six-session program designed by Colquhoun and Cullen (1981) focused on refusal skills training provided by classroom teachers with the help of local physicians. Biglan, Glasgow, et al. (1987), on the other hand, trained health and science teachers to deliver intervention sessions on four consecutive days, followed by a booster session two weeks later.

Other intervention variations have used a combination of trained staff or teachers plus student peer leaders. Perry, Klepp, and Sillers (1989), for example, used same-age peers in a smoking-prevention program that promoted cardiovascular health. Ellickson and Bell (1990), on the other hand, employed trained health educators to deliver their intervention to seventh graders and contrasted this approach by delivering the intervention through students' regular teachers assisted by teen leaders. Similarly, Arkin et al. (1981) organized seventh-grade student nominations of classmates who students felt would be effective peer leaders. Those selected then served as discussion leaders and helped students rehearse and role-play appropriate responses to situations that simulated social pressure.

In Project SHOUT (Students Helping Others Understand Tobacco), college undergraduate students in psychology, health sciences, and other majors worked for college credit toward their degrees by serving as peer leaders to young adolescents. The college students were mature and reliable enough to deliver interventions (both in the classroom and over the telephone, in booster calls) yet sufficiently youthful to be acceptable to an adult-wary audience (Young et al. 1988; Young et al. 1990; Elder et al. 1993).

Table 4. Essential elements of school-based smoking-prevention programs

1. Classroom sessions should be delivered at least five times per year in each of two years in the sixth through eighth grades.

2. The program should emphasize the social factors that influence smoking onset, short-term consequences, and refusal skills.

3. The program should be incorporated into the existing school curricula.

4. The program should be introduced during the transition from elementary school to junior high or middle school (sixth or seventh grades).

5. Students should be involved in the presentation and delivery of the program.

6. Parental involvement should be encouraged.

7. Teachers should be adequately trained.

8. The program should be socially and culturally acceptable to each community.

Source: Glynn (1989).

Other variations in intervention approaches have used media supplements and involved students' parents. Flay et al. (1987), for example, used a five-day smoking-prevention curriculum in junior high school classrooms and coordinated it with five different five-minute video segments aired on a local television station. The focus of these television segments was smoking prevention, and they were followed the next week by five more segments dealing with smoking cessation (Flay et al. 1987).

Pentz et al. have trained health, science, and social studies teachers to deliver a social influences program that was reinforced by 10 homework activity sessions involving parents and other family members in role playing and other forms of behavioral rehearsal (Pentz, Dwyer, et al. 1989). In a related project, this group has developed a component that asks parents to attend organizational meetings, support school activities, and participate in an educational workshop (Pentz, MacKinnon, Flay, et al. 1989). The results of these studies are discussed later in this chapter, along with other community programs.

Biglan, Glasgow, et al. (1987), have also designed a component that tries to enlist direct parental support of their standard classroom curriculum. The component relies on a set of four mailed messages for parents of participating students. These messages reinforce classroom activities, encourage family discussions of smoking in general, and urge parents to establish family policies regarding smoking.

Walter, Vaughan, and Wynder (1989) embedded smoking education in a comprehensive school health education program, the Know Your Body Program, with fourth- through eighth-grade students in New York. This more comprehensive program had a significant impact on multiple risk-related behaviors, including cigarette smoking.

Finally, Cain, Dudley, and Wilkerson's (1992) "Tar Wars" program has used health professionals to deliver antitobacco messages with the help of fourth-, fifth-, and sixth-grade children. The students participate in a poster contest to counter the messages of tobacco advertising, and a communitywide media campaign complements the school program. Originating in 1977, this program is based on the DOC program Superhealth 2000, which similarly emphasized counteradvertising skills among 7th- through 10th-grade students (Blum 1980).

A number of recent reviews have closely examined issues related to program design and content (Botvin and Wills 1985; Flay 1985; Glasgow and McCaul 1985; Hansen 1992). Rather than replicate these efforts here, the next section will provide examples of the range of programs that can teach adolescents the skills needed to resist social influences to smoke.

Exemplary Programs for Resisting Social Influences

Social Inoculation

In the mid-1970s, Evans et al. developed the first prevention program that instilled adolescent skills to resist social influences to smoke. The program, described as "social inoculation," taught students methods for recognizing and coping with pressures to smoke from peers, family, and the media (McGuire 1964). The program's hypothesis was that if young adolescents received classroom "inoculations" of "peer pressure," for example, and learned how to deal with it, they would be more prepared to resist actual social pressure from peers. Additional emphasis was placed on the immediate physiological impairments that smoking produces, rather than on long-term consequences (Evans et al. 1979). The program used videotapes of nonsmoking peers to impart information and to teach skills needed to resist social influences. In the pilot study involving 750 seventh-grade students, the proportion of nonsmokers in the experimental group who 10 weeks earlier had reported smoking at least one cigarette was approximately half that of those in the control group.

This research group introduced a notable procedure for enhancing the validity of self-reported smoking behavior among study subjects. Students were shown a film indicating that their smoking status could be verified biochemically by analyzing a sample of their saliva. The perception that the samples could be examined led to more truthful reporting by students and thereby decreased misclassification bias due to inaccurate self-reports (see "Validity of Measures of Smoking," Appendix 2, in Chapter 3).

Although interpretations of results from this early work were complicated by a variety of methodological flaws (Flay 1985), Evans' work provided the foundation for much of the smoking-prevention research that followed over the next decade.

Project CLASP

Later in the 1970s, McAlister et al. (1980) developed an intervention called Counseling Leadership About Smoking Pressure (CLASP), during which peer leaders from high school were trained to help junior high school students develop the skills needed to resist social pressures to smoke. The students learned to identify social pressures and then rehearsed and modeled strategies for coping with them (McAlister et al. 1980).

Besides this use of older students as peer leaders, the use of behavioral rehearsal methods and strategies to enhance commitment to nonsmoking was an innovation that has been incorporated into many of the prevention programs developed later. The intervention consisted of three sessions delivered on consecutive days, followed by four booster sessions delivered over the remainder of the seventh-grade school year. Nine months after pretest, 5.6 percent of the treatment group and 9.9 percent of the control group reported smoking during the previous week—a statistically significant 56 percent difference between the groups. These reductions in smoking prevalence were observed up to the 10th grade.

Life Skills Training

Botvin (1986) has developed another variation of the social influences approach that includes resistance skills, behavioral rehearsal, role playing, self-control, decision making, problem solving, and self-reward, as well as components devoted to increasing self-esteem, self-confidence, autonomy, and assertiveness. The program, called Life Skills Training, includes various aspects of cognitive-behavioral psychological training. The program consists of 15 to 20 sessions for seventh-grade students; booster sessions are given in the eighth and ninth grades. The specific objectives of the program are to teach skills that help students resist direct pressures to smoke; to enhance students' self-esteem, self-mastery, and self-confidence in order to decrease their susceptibility to indirect social pressures to smoke; to prepare students to cope with anxiety induced by social situations; to enhance students' knowledge of the actual prevalence of smoking among adolescents and adults; and to promote attitudes and beliefs consistent with nonsmoking.

This program has been evaluated extensively in progressively larger studies over the past decade; the encouraging results have ranged from 40 to 80 percent reductions in smoking prevalence, and long-term effects have lasted up to four years (Botvin and Dusenbury 1989). In the most comprehensive evaluation of the Life Skills Training program to date, 56 schools in three different geographic regions were randomly assigned to three study conditions: Life Skills plus one-day teacher training, Life Skills plus video training for teachers, and a control condition. Significant positive effects were reported for cigarette use (see Table 5) and for smoking-related knowledge, attitudes, and normative expectations. In most cases, the two treatment conditions had similar results; students in both groups demonstrated more positive effects than students in the control group (Botvin et al. 1990). The effects of the Life Skills Training program have been demonstrated when the program has been delivered by project staff, older peers, or regular classroom teachers. These effects have also been demonstrated on inner-city

Table 5. Outcomes of the Life Skills Training (LST) program: adjusted third-year follow-up mean for smoking-related knowledge, expectations, personality measures, and behavior

	Adjusted mean scores*		
Smoking variable	LST (with teacher training)	LST (with video training)	Control
Knowledge			
Smoking prevalence	1.10$^{\|}$	1.16†	.93
Smoking consequences	4.80$^{\|}$	4.60$^{\|}$	4.13
Smoking acceptability	1.49§	1.52$^{\|}$	1.37
Normative expectations			
Adult smoking	3.92†	3.95†	4.22
Peer smoking	3.80†	3.77†	3.92
Personality measures			
Self-esteem	34.25†	34.07	33.65
Self-efficacy	19.27	19.20	19.26
Social anxiety	28.71‡	29.36	29.92
Smoking behavior	1.46§	1.50‡	1.63

Source: Botvin et al. (1990).

*Means for LST groups differ from control group at $^{\dagger}p < .05$, $^{\ddagger}p < .01$, $^{\S}p < .001$, and $^{\|}p < .0001$.

populations of predominantly Hispanic (Botvin et al. 1992) and black (Botvin et al. 1989; Botvin and Cardwell 1992) adolescents.

The SODAS Model

Several researchers have developed a variation of the social skills training approach that adds to the basic components of resistance skills, behavioral rehearsal, and role playing. The additional components focus on self-control, decision making, problem solving, and self-reward. Using a problem-solving approach called Stop, Options, Decide, Act, and Self-Praise (SODAS), students are taught self-control skills for smoking prevention coupled with self-reward for personal successes (Schinke et al. 1986; Gilchrist et al. 1986).

This research group has conducted a variety of studies evaluating this intervention model in different settings and using varied delivery modalities. The results of these studies have consistently demonstrated that treatment students reduce their smoking prevalence more than control students and that treatment students have greater positive changes in smoking-related knowledge and attitudinal factors (Schinke and Gilchrist 1984, 1985, 1986).

The Waterloo Smoking-Prevention Program

Investigators at the University of Waterloo (Ontario, Canada) have carried out a series of large-scale, longitudinal studies evaluating the efficacy of an intervention that teaches sixth-grade students the skills they need to resist social influences to smoke. This intervention is based on an integrative model of attitude and behavior changes surrounding health issues that suggests that if information is attended to, comprehended, and accepted, it may lead to changes in beliefs. Beliefs, however, will not necessarily lead to changes in attitudes, and attitudes will not necessarily lead to changes in intentions unless values, expectancies, and social influences are considered. Lastly, intentions will not necessarily lead to changes in behavior unless the individual has the requisite control and coping skills (Flay 1986).

The intervention program has three main components that are delivered to sixth graders in six one-hour weekly sessions. The first component provides information on the consequences of smoking and the reasons that adolescents smoke. The second component examines social influences—including family, friends, other peers, and the media—that promote smoking; students then learn specific skills to resist these pressures. In the third component, the students are asked to integrate information learned in all previous sessions in order to make a decision about their future smoking behavior and to publicly commit to nonsmoking, if that is their decision.

In the first large-scale randomized trial of this program, 22 schools were randomly assigned to treatment and control conditions. Sixth-grade students in the 11 treatment schools received the curriculum plus booster sessions in seventh and eighth grade. Initial evaluation results indicated that although the intervention did not reduce levels of regular smoking or significantly increase the probability of remaining a nonsmoker, it prevented the onset of experimental smoking through the end of the eighth grade. The results were particularly encouraging for students who were at highest risk of becoming regular smokers because they had tried smoking in grade six or because their parents, siblings, or friends were smokers (Best et al. 1988).

The University of Waterloo research group has reported six-year follow-up data for the same cohort of students studied earlier through the eighth grade. Ninety percent of the students were located for this follow-up study, and data were obtained from over 80 percent of them. These students had not received any additional intervention after the eighth grade. The significant intervention effects observed in this cohort after the eighth grade had begun to disappear by the fifth year after the intervention; by the sixth year, there was no longer a significant difference between treatment and control students (Flay et al. 1989). These results (see Figure 2) suggest that the initial positive impacts of such interventions may dissipate over time (Kozlowski et al. 1989), particularly if intervention activities and booster sessions do not extend throughout middle school, junior high, and high school (Botvin and Botvin 1992). School-based programs may also be strengthened by supplementary intervention activities that extend beyond the school context into the community (Perry, Klepp, Shultz 1988; Perry et al. 1992).

The Minnesota Smoking-Prevention Program

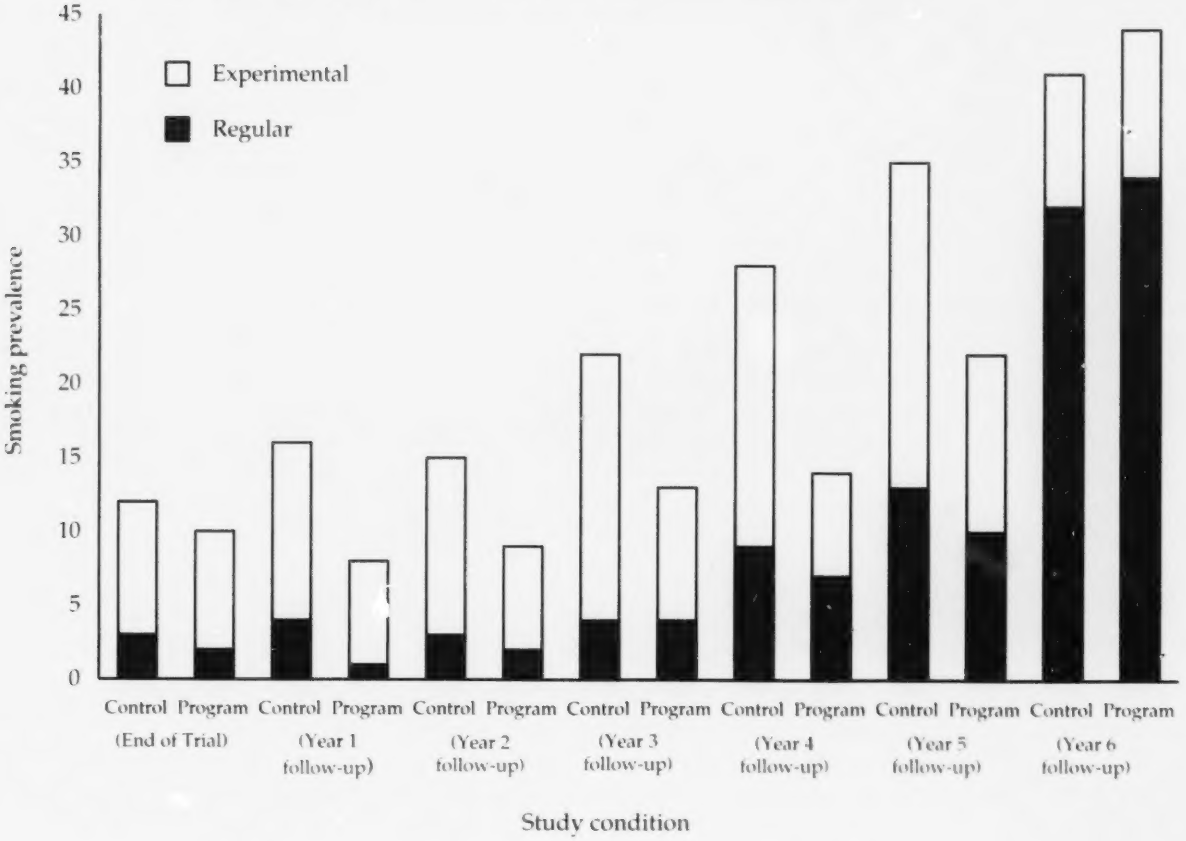
The Minnesota Heart Health Program is a community-based cardiovascular disease prevention program that has been carried out in selected Minnesota study communities during the past decade (Blackburn et al. 1984). As a part of this program, the Minnesota Smoking-Prevention Program (MSPP) has addressed the prevention of tobacco use by influencing the social and psychological factors known to promote the onset of smoking.

The activities in MSPP are often led by peer (same-age) leaders who are trained to communicate the social and psychological messages embodied in the program. The students first form small groups to discuss the short-term, social consequences of smoking. By examining actual data and discussing young people's tendency to overestimate smoking prevalence, students learn that smoking is not a normative behavior in our society. After exploring why adolescents smoke, students discuss positive alternatives to smoking. Students then learn how these misperceptions about smoking are established in our culture through advertising and role modeling by peers and adults. Students practice the skills to resist the social influences that promote smoking, including peer influences and advertising techniques. Near the end of the program, students state a goal to remain nonsmokers.

In evaluating the effects of the MSPP in eight junior high schools, Murray et al. (1988) reported that after four years, the peer-led social influences intervention reduced the incidence of daily and weekly smoking by 35 to 50 percent. In contrast, no reduction was observed in an adult-led group that was taught the health consequences of smoking or in a comparison group enrolled in an existing curriculum covering general health topics. These differences, however, were no longer statistically significant at the five- and six-year follow-ups (Murray et al. 1988).

As part of this overall research program, the Class of 1989 Study was established to test the efficacy of the MSPP approach when introduced as part of a broader, community-based health promotion effort (Perry et al. 1992). Researchers hypothesized that the school-based intervention program would have longer-lasting effects if it was introduced in communities where adults were involved in communitywide smoking-cessation programs, where antismoking ordinances in the schools and public community spaces were being considered, and where integrated school and community intervention

Figure 2. Six-year follow-up of the first Waterloo School Smoking Prevention Trial: proportion of subjects smoking regularly and experimentally at each wave of the study



Source: Flay et al. (1989).

activities were offered. Throughout junior and senior high school, smoking prevalence was significantly lower among students in the intervention community than among students in the control community. The results of this study are discussed later in this chapter, along with other communitywide programs.

International Research on Smoking-Prevention Programs

Intervention studies reported in the English-language literature outside the United States concentrate primarily on school-based interventions directed at secondary school students (persons aged 11 years or older). In many cases, these intervention programs have adopted some elements of U.S. school programs in order to reflect different local conditions. This section reviews several of the more rigorously evaluated programs and pays particular attention to programs that have been followed up for two or more years after intervention.

Western Australia

Armstrong et al. (1990) conducted a large randomized trial evaluating peer- and teacher-led social influence programs among 12- and 13-year-old students in Western Australia. The authors used the MSPP program (Arkin et al. 1981) and resurveyed the students one year and two years after the intervention. Although the effects of the program were not strong, at the two-year follow-up, the smoking prevalence in the control group was 6.6 percent higher than in the teacher-led intervention group and 8.1 percent higher than in the peer-led intervention group.

North Karelia Youth Project

The North Karelia Youth Project in Finland (part of the International Know Your Body study) was a two-year controlled trial that targeted schoolchildren in grade seven (12 and 13 years old) and included components on smoking prevention, physical activity, and reduction of dietary fat and alcohol consumption (Puska et al. 1981, 1982). The smoking intervention program was peer-led and involved three 45-minute sessions for grade seven; these students received seven shorter sessions the following year (a schedule similar to that of Project CLASP). The program included sessions on social pressures to smoke, ways to resist such pressures, ways to cope with social anxiety, the short- and long-term health effects of both active and passive smoking, and the impact tobacco growing has on the environment.

Health educators from the project team delivered a direct, intensive intervention (intervention A) in two schools (one urban and one rural). A less intensive, countywide intervention (intervention B) provided materials and training to local youth and temperance workers. The evaluation involved the two intervention A schools, two matched intervention B schools selected from the county, and two matched reference schools selected from another county that did not receive an organized intervention. Puska et al. (1982) found that among boys, the prevalence of occasional smoking (one or two times per month) had increased by 30 percent in the reference group, by 8 percent in the A group, and by 13 percent in the B group. Among girls, the prevalence of occasional smoking had increased by 20 percent in the reference group, by 18 percent in the A group, and by 9 percent in the B group. Vartiainen et al. (1990) reported the results of an eight-year follow-up and found that the prevalence of "any smoking" in the reference group was 10 percent higher than in the A group and 16 percent higher than in the B group.

United Kingdom

In the United Kingdom, Nutbeam et al. (1993) conducted a controlled trial of two school-based interventions. The Family Smoking Education Project was derived from a program first developed in Norway (Aarø et al. 1983). Directed toward 10- through 12-year-olds, the project consisted of five lessons on the immediate health effects of smoking and on the wider environmental impact of tobacco growing and use. A notable feature was a leaflet sent to parents to encourage their support for school-based smoking education. The Smoking and Me project was the United Kingdom adaptation of the MSPP. Directed toward 10- through 12-year-olds, the program consisted of six sessions highlighting a range of social influences and equipping students with skills to manage these social pressures. At the first-year and second-year follow-ups, no differences were observed between the intervention population and the control population for either smoking uptake or personal skills.

Overall, school-based smoking education programs that have been evaluated internationally have met with limited success in the past decade. In general, these programs were brief and were not continued through the high school years. Many countries are taking more comprehensive approaches to smoking control among young people; such approaches include community action, further restrictions on tobacco advertising and promotion, and substantially higher tobacco tax rates than are found in the United States.

Meta-Analyses of School-Based Smoking Prevention

Extensive discussions of the methodological issues inherent in research on smoking prevention have been thoroughly discussed elsewhere (Cook and Campbell 1979; Flay 1985; Biglan, Severson, et al. 1987; Murray and Hannan 1990). The primary issues have included questions of mixed units of analysis, attrition of the subject (student) population, integrity of implementation, and homogeneity of the subject population. These issues have been partly accounted for in four important meta-analytic studies published since 1980.

Tobler (1986) examined 143 studies of drug-use prevention programs for 6th- through 12th-grade students and found that these programs had an overall significant impact on behavior, skills, and knowledge. The study also found that peer-led programs and programs dealing with social influences were more effective than other modalities. Tobler (1992) later confirmed these findings with more rigorous analytic methods. The Rundall and Bruvold (1988) meta-analysis of 40 studies of school-based programs to prevent smoking examined knowledge, attitude, and behavioral outcomes of social influence programs versus traditional programs; the social influence programs were more likely to affect attitudes and behavior. Rooney (1992) examined 90 school-based tobacco-use prevention programs conducted from 1974 through 1989 that sought to develop skills to resist social influences. The meta-analysis took into account the clustering of students in schools and used the school as the unit of analysis. Results indicated that smoking prevalence was 4.5 percent lower among students in the social influence programs than among students in control conditions. The social influence programs that were most effective at one-year follow-up were those that were delivered to sixth-grade students, that used booster sessions, that concentrated the program in a short time period, and that used an untrained peer to present the program. Under these more optimal conditions, long-term smoking prevalence was reduced by about 25 percent.

Bruvold's meta-analysis (1993) included 94 separate interventions from the 1970s and 1980s. The intervention programs were categorized as rational (providing factual information), developmental (increasing self-esteem and decision-making skills), social-norms–oriented (providing alternatives and reducing alienation), and social-reinforcement–oriented (developing skills to deal with social pressures to smoke). The meta-analysis showed that the rational approach had very little impact on smoking behavior, that the developmental and social norms approaches had equivalent and intermediate impact on smoking behavior, and that the social reinforcement approach had the greatest impact on smoking behavior (Bruvold 1993).

Discussion

In retrospect, research on smoking prevention has by its very nature had to contend with various threats to validity posed by factors such as mixed units of analysis, differential attrition, and inconsistent implementation. To a large extent, the most recent research studies have been designed to deal with these methodological obstacles and have still found moderately strong prevention effects (Rooney 1992; Bruvold 1993). Therefore, most reviews of the smoking-prevention research literature consistently have come to the same conclusions, which can be summarized under three general findings.

First, a variety of individual research reports (Botvin and Dusenbury 1989; Flay et al. 1989), several comprehensive literature reviews (Flay 1985; Best et al. 1988), and four meta-analyses (Tobler 1986; Rundall and Bruvold 1988; Rooney 1992; Bruvold 1993) have all reported lower prevalences of smoking among students in social influence programs than among students in equivalent comparison groups or randomly assigned control groups. The difference between treatment and nontreatment groups ranges from 25 to 60 percent and persists from one to four years.

Second, as Best et al. (1988) have underscored, given the number of research studies, the variability in program format and scope, the various communities and cultures in which these studies were undertaken, and the potential threats to internal and external validity in school-based research, the consistency of overall findings and reductions in smoking prevalence across all these studies is rather remarkable.

Third, it has been observed repeatedly that the positive shorter-term intervention effects reported in adolescent smoking-prevention studies tend to dissipate over time (Murray et al. 1989; Pentz, MacKinnon, Dwyer, et al. 1989; Flay et al. 1989; Ellickson, Bell, McGuigan 1993). This general trend has been particularly evident among school-based intervention studies that included little or no emphasis on booster sessions, few (if any) communitywide activities, or few (if any) mass-media–based components (Botvin, Renick, Baker 1983; Perry, Klepp, Shultz 1988; Botvin and Botvin 1992). These interventions may be enhanced if they are embedded in a more comprehensive school health education program (Allensworth and Kolbe 1987; Walter, Vaughan, Wynder 1989). The comprehensive school health approach needs further evaluation but is promising as an effective prevention tool.

Only the social influence approaches have been scientifically demonstrated (through replicated research studies) to reduce or delay adolescent smoking. Still, the effects of these programs have not been sustained without additional educational interventions or community components. This experience suggests that programs grounded in school-based skills training are indeed important for preventing smoking, although more sustained and comprehensive efforts may be needed for long-term success.

The concept of reciprocal determinism (Bandura 1986) would argue that these complementary components should target the elements of the dynamic person–environment interaction that school-based interventions may not be capable of reaching, much less influencing. These components would include the types of community, environmental, legislative, policy-based, and societal interventions described later in this chapter.

Preventing Smokeless Tobacco Use

Introduction

The 1986 publication of the Advisory Committee's Report to the Surgeon General (USDHHS 1986b) on the health consequences of using smokeless tobacco (chewing tobacco and snuff) and subsequent reports of widespread use of smokeless tobacco among children and adolescents (Boyd et al. 1987; USDHHS 1992b) have called forth a wide range of written and media materials (including films, pamphlets, and video programs) on the risks of using smokeless tobacco (Wilson and Wilson 1987; Laflin, Glover, McKenzie 1987). These materials, made available to school personnel and parents, have aimed at countering the perception that smokeless tobacco is a safe alternative to cigarettes. Materials have been produced by federal agencies (such as the NCI and the National Institute of Dental Research), voluntary nonprofit groups (such as the ACS), and professional organizations (such as the American Dental Association and the American Academy of Otolaryngology). These materials have been distributed widely, but the degree of their diffusion has not been evaluated, nor has their effect on young people's use of smokeless tobacco.

Evaluation of School-Based Efforts

Because the increased use of smokeless tobacco among youth is a relatively recent phenomenon, few programs for preventing adolescent use of these products have been evaluated for either short- or long-term efficacy. Those that have been evaluated have been but one component of a broad tobacco-prevention program.

In response to the emerging concern about the health risks of regular smokeless tobacco use, the National Institutes of Health has funded numerous research grants to develop interventions to prevent initiation or regular use and to promote or assist cessation for adolescent and young adult users. Nine research grants on smokeless tobacco use have been funded by the NCI since 1987; most are focused on adolescent populations (USDHHS 1990b), and results are pending. Although most of these projects have been school-based prevention activities, some programs have targeted youth in non-school settings (e.g., 4-H clubs, Little League baseball clubs, and Native American community centers).

The prevention programs that have been evaluated have targeted both smoking and smokeless tobacco use among middle and high school students. The primary focus has been on middle school (grades 6–8, ages 12–14). Smokeless tobacco prevention has also been included as part of more comprehensive curricula to prevent drug use, such as *Here's Looking at You, 2000* (Roberts, Fitzmahan & Associates, Inc., and Comprehensive Health Education Foundation 1986), or as part of community-based interventions to reduce drug use. Seldom have programs to prevent smokeless tobacco use been instituted independent of other substance-use prevention or of a more general tobacco-use prevention effort. Since smokeless tobacco products are used primarily by males, the overall prevalence of use is lower than that of smoking. There is also less concern about the health effects of smokeless tobacco than about those of illegal drugs and cigarettes. This logical inclusion, however, of smokeless tobacco prevention in the context of other prevention efforts makes the evaluation of the smokeless tobacco component problematic.

A factor that more directly obscures the importance of smokeless tobacco prevention is the widespread acceptance of use by both young people and parents. Youth generally perceive that smokeless tobacco use is a safe alternative to cigarette smoking. For example, in one study, 77 percent of school-aged children believed that cigarette smoking was very harmful to one's health, yet only 40 percent believed the same of smokeless tobacco use (Schaefer et al. 1985). Parents are also more likely to accept smokeless tobacco use than smoking among teens (Chassin, Presson, Sherman 1985; see "Parental Reaction to Smokeless Tobacco Use" in Chapter 4).

The Oregon Research Institute Program

In several studies, young adolescents have received a preventive curriculum that targeted both smoking and smokeless tobacco use. In one such study (Severson et al. 1991), a social influences program conducted by the Oregon Research Institute was delivered by regular classroom teachers and by same-age peer leaders to entire classrooms in randomly assigned schools. The brief seven-session program significantly reduced smokeless tobacco use among males in both seventh and (to a lesser extent) ninth grades. Parallel analysis failed to show that the intervention had any positive effect on cigarette smoking. The results for smokeless tobacco use, however, were particularly encouraging, since only two of the seven class periods of the intervention were devoted to smokeless tobacco.

The intervention used in the Severson et al. (1991) study sought to make students sensitive to overt and covert pressures to use tobacco and taught effective ways to respond to these pressures. The students practiced how to refuse offers of tobacco. Besides using a structured curriculum with role-play activities, the teacher used videotapes to standardize instruction and maintain student interest. The program was taught by regular classroom teachers; same-age peer leaders assisted in role-playing activities for the seventh-grade students. A videotape titled *Big Dipper* (Oregon Research Institute 1986) was developed to highlight the physical and social consequences of smokeless tobacco. To involve parents, brief brochures were mailed to students' homes.

Toward No Tobacco Use

A study by Sussman et al. (1993) reports positive results in their Toward No Tobacco Use (TNT) project for reducing smokeless tobacco use. The study compared four different prevention curricula developed to counteract three types of factors related to the onset of tobacco use that are typically addressed within a comprehensive social-skills program. These include peer approval for using tobacco, incorrect social information provided about tobacco use, and lack of knowledge about physical consequences of tobacco use. The development of these curricula is detailed in previous reports (Sussman 1991).

Smokeless tobacco use was significantly less prevalent among students who had received the TNT intervention than among those who had not (Sussman et al. 1993). The results of the evaluation of this 10-lesson curriculum intervention suggest that learning about the physical consequences of smokeless tobacco use can be as successful as a social influences program and that a combination of both is probably best for deterring use of smokeless tobacco. The Sussman et al. (1993) study in southern California and the Severson et al. (1991) study in Oregon suggest that smokeless tobacco use can be reduced through school-based programs that try to prevent all types of tobacco use among seventh- and ninth-grade students.

Project SHOUT

Elder et al. (1993) developed Project SHOUT, a social influences program that has been evaluated in 22 junior high schools in San Diego County, California. Based on an operant conditioning model of tobacco use (Elder and Stern 1986), the intervention was delivered in randomly assigned schools to seventh-grade students. Intervention and assessment continued for three years (through seventh, eighth, and ninth grades). Because of multiple school changes at the end of the eighth grade, Project SHOUT used telephone calls and program newsletters for the ninth-grade intervention.

At the three-year follow-up, the intervention had a significant effect on cigarette use, smokeless tobacco use, and combined cigarette and smokeless tobacco use. The intervention effect was particularly strong during the ninth grade (Elder et al. 1993). The three-year intervention and follow-up is a strength of this study; previous studies have been limited to a single intervention year and one-year follow-up.

Programs for Native American Populations

Smokeless tobacco use by Native American youth on reservations is higher than that of other groups (Schinke et al. 1989). There is evidence of early, frequent, and heavy use of snuff and chewing tobacco by Native American children and Alaskan Natives (Schinke et al. 1987). Young people in these populations begin using smokeless tobacco at an early age, and girls use it at levels almost equal to boys (Schinke et al. 1987). Current reservation-based interventions aimed at reducing this pattern of smokeless tobacco use have not yet been evaluated. These ongoing programs are sensitive to the unique aspects of tobacco use by Native Americans, since tobacco has traditionally played a role in sacred rites. The programs make extant materials appropriate for Native American children by creating a specific curriculum for the tribal group and having Native Americans provide the intervention in schools or other settings on their reservation.

Smoking Cessation

Introduction

Few studies have examined adolescent smoking cessation. The four primary sources of information on adolescent cessation are national probability surveys on patterns of adolescent attempts to quit (see "Attempts to Quit Smoking" and "Self-Reported Indicators of Nicotine Addiction Among Smokers" in Chapter 3), convenience sample surveys of adolescents who have tried to quit on their own, reports from prevention projects on effects of treatment on youth who were smokers at baseline, and programs that explicitly try to recruit adolescent smokers into cessation programs. The relatively few intervention studies vary considerably in scientific quality; many are anecdotal or descriptive accounts of programs.

Convenience Samples of Adolescents Who Try to Quit Smoking

Although national surveys ask a great many respondents a few questions about quitting smoking, some smaller studies have more deeply probed the experience. The role of nicotine's pharmacologic effects has received increasing attention, culminating in the 1988 Surgeon General's report on nicotine addiction. The report demonstrated that cigarette smoking is characterized by the same addictive processes that have been observed with other drugs that are abused (USDHHS 1988). Recent observations of adolescents who have tried to quit smoking suggest that dependency or addiction has developed in many adolescent smokers and may play an important role in their attempts to quit. Data from both Great Britain (McNeill et al. 1986; McNeill 1991) and the United States (Hansen 1983; Hansen et al. 1985; Ershler et al. 1989) show that many adolescents who try to quit have withdrawal symptoms that parallel those reported by adult smokers (see "Nicotine Addiction in Adolescence" in Chapter 2).

In a survey of 116 British schoolgirls (aged 11 through 17) who had tried to quit smoking, 63 percent reported withdrawal effects. The degree of withdrawal effects was related positively to both self-report and biochemical measures of nicotine intake (McNeill et al. 1986). These findings were replicated, although without biochemical measures, in a study of American 6th- through 12th-graders of both sexes (Ershler et al. 1989). Over half of the smokers in both of these studies reported attempts to quit, and most were unsuccessful. These observations, along with other data summarized in Chapters 2, 3, and 4, strongly suggest that adolescent smoking is more than socially driven and that addictive processes in adolescents are similar to those that characterize adult smoking.

Effect of Smoking-Prevention Programs on Cessation

Smoking-prevention programs have typically, and appropriately, targeted younger adolescents. In these populations, prevalence rates tend to be low, and those who smoke are mostly doing so infrequently. These studies, reviewed earlier in this chapter, focus on preventing onset or on preventing the progression from experimentation to regular smoking. The impact of smoking-prevention programs on students who are experimental or regular smokers appears to be small and inconsistent (Best et al. 1984; Johnson et al. 1986; Biglan, Severson, et al. 1987). However, the small number of regular smokers (that is, those who smoke every week) tends to preclude meaningful analyses of cessation resulting from these programs (Best et al. 1984).

Cessation Interventions in the School

Young people who smoke have been a persistent concern of both educators and voluntary health agencies. A number of materials and programs for adolescent smoking cessation have been developed and implemented, but evaluation typically has been anecdotal or descriptive (Hulbert 1978; Patterson 1984; Brink et al. 1988). Many of the older programs are described by Thompson (1978), USDHEW (1979), and Seffrin and Bailey (1985). Cessation programs are sometimes led by peers, sometimes by teachers or volunteers. Participants are recruited through school channels such as newsletters, classes, and public address announcements. Evidence from these descriptive reports, as well as from some of the formal research programs described below, indicates that recruitment is difficult; adolescent smokers are hesitant to come forth. In some instances, the participants in the school cessation programs are referred by school authorities for infractions of school smoking policies and are thus not coming to these programs voluntarily.

These issues are illustrated by a program evaluation reported by the American Lung Association (unpublished data). The program, developed by a Minnesota affiliate of the American Lung Association, was evaluated in 22 schools in four states. A total of 241 students (mean age = 16 years old) participated in eight 50-minute sessions during school hours over a four-week period. Over half the students, however, were required to participate as a consequence of being caught smoking on school grounds. This inclusion of nonvoluntary participants may partly explain the program's low success rate: at the end of the sessions, only 30 students (14 percent) reported that they were abstinent (program dropouts were counted as smokers). Low cessation rates like these, coupled with recent legislation such as the Oregon law forcing school authorities to take action against students caught smoking on school grounds, signal the need for more effective cessation approaches for student smokers.

Lotecka and MacWhinney (1983) compared an intervention group focusing on cognitive behavioral skills (N = 53) with a group only receiving health information (N = 54). Less than 50 percent of the students in each group participated in the three-month follow-up. Of those assessed at that time, 78 percent of the students in the cognitive behavior group reported a decrease in smoking, and only 4 percent reported an increase; the comparable figures for the information-only group were 46 percent and 31 percent. No information was provided on complete abstinence. Given that reported rates of smoking are relatively unreliable and that the program did not report cessation rates, this study cannot be considered conclusive.

Perry et al. (1980, 1983) conducted two school-based cessation interventions in California schools. In the first, 10th-grade classes in three high schools (N = 477) received a special program that focused on immediate physiological effects of smoking and on social cues that influence the adoption of smoking. Classes in two control schools (N = 394) received standard information on long-term health effects. The program consisted of four consecutive 45-minute sessions in regular health classes conducted in the fall. Posttest outcome data were obtained approximately five months later and included carbon monoxide measures of smoking. At the posttest, the experimental group, compared with the control group, had a significantly greater percentage of subjects who reported abstinence in the previous week (22 vs. 16 percent) and month (30 vs. 24 percent). Parallel significant differences were also found for carbon monoxide measures.

In their second study, the Perry group (1983) tried to sort out the specific efficacious components within the intervention program by analyzing three kinds of programs—those that discussed long-term health effects (the control group), those that discussed immediate and long-term physiological effects, and those that discussed social consequences—and comparing programs taught by either teachers or college students. Twenty health classes and four high schools were randomized by using a factorial design. The study obtained three-month follow-up data that included self-reports and carbon monoxide breath tests. Using entire 10th-grade health classes solved the recruitment problem but yielded a limited number of current smokers; the relatively small number of pretest smokers in this study (N = 82) precluded finding any significant difference between the groups. Overall, 23 percent of the pretest smokers reported not smoking at the three-month follow-up. Teachers tended to be more effective with the traditional curriculum covering long-term health effects, and college students seemed more effective with the social influences curriculum.

The largest and most systematic school-based adolescent cessation study has not yet been published. Burton et al. (unpublished data) worked with rural and suburban high schools in two states. Within each of the 16 treatment schools, students volunteering to participate in a cessation clinic were randomly assigned to a clinic or to a control group of students told they were on a waiting list. Clinic students were further randomly assigned either to a clinic designed to address addiction or to one designed around psychosocial dependency. Clinics consisted of five sessions spaced over one month. A follow-up session was held three months after the fifth session. The control participants were also invited to the follow-up session, where smoking status was assessed both by self-report and measurement of saliva cotinine.

At the three-month follow-up, 8.4 percent of clinic participants and 10.5 percent of controls were abstinent. When corrected for biochemical verification, these figures become 6.8 and 7.9 percent, respectively. There was considerable attrition; students lost to follow-up were assumed to be smokers. The negative results in the study are especially sobering because the investigators had previously conducted 31 focus groups with adolescents to help inform the intervention's recruitment strategies and content (Sussman et al. 1991).

Difficulty in recruiting adolescent smokers in school programs has been a pervasive problem for investigators. Adolescents may be concerned about parents or teachers learning that they smoke (since parental consent could be required for participation). Adolescents may also be less motivated than adults to quit, since long-term health consequences carry less weight with the young. A simpler explanation of low recruitment is that prevalence rates are low; schools do not provide large populations of smokers from which to recruit. Multisite trials that pool subjects may be needed before rigorous and meaningful evaluations can take place.

Cessation Interventions Based Outside the School

Hollis et al. (in press) tried an unusual approach to recruit young smokers. Adolescents between 14 and 17 years of age who were members of a large health maintenance organization (HMO) were mailed a screening questionnaire that asked about "health habits." Those who reported that they had smoked in the past week were asked if they would participate in a two-year study of adolescent health and were randomly assigned to either an intervention group that received help to quit smoking or a control group that received no such help.

The focus of the intervention was an office visit with a nurse practitioner at a conveniently located HMO clinic. Incentives were offered for attending these sessions, each of which lasted about 60 minutes. The participants reviewed their health history, watched and discussed a video on adolescent smoking cessation, were encouraged to set a quit date, and were given tips and strategies for successful quitting. Those who wanted to quit smoking received a follow-up call one week later; additional calls were also made, depending on the adolescent's continued interest in quitting. Participants who had quit smoking were eligible to participate in a lottery with chances to win $100.

All participants were followed up at one year, at which time both self-report and biochemical (saliva cotinine, carbon monoxide) data were obtained. The intervention and control groups had similar self-report measures of smoking (i.e., measured in number of cigarettes in the last month, week, day) and similar biochemical indicators of smoking. No relationship was found between the number of contacts with the HMO interventionist and either quitting rates or the number of cigarettes smoked. Similar interventions in health care settings with adult smokers have usually yielded positive results (e.g., Hollis et al. 1991), but this was clearly not the case for adolescent smokers.

Discussion

The data reviewed indicate consistently that adolescent smokers frequently try to quit but are usually unsuccessful, often have withdrawal reactions much like adult smokers, are difficult to recruit and retain in formal cessation programs, and are not responsive to programs thus far developed. Further basic research and new directions for intervention are clearly needed. Data presented in Chapter 3 (see "Adult Implications of Adolescent Smoking") from the Monitoring the Future Project show that well over 80 percent of adolescents who smoked half a pack a day or more as seniors in high school (over 15 percent of the sample) were smoking five to six years later as young adults; over half of these were smoking a pack or more a day at follow-up. In the absence of intervention, adolescent smokers will most likely become adult smokers.

Smokeless Tobacco Cessation

Introduction

Of the estimated six million people who regularly use smokeless tobacco, half are under age 21 (USDHHS 1986b). Data from several national surveys show an increase in the prevalence of smokeless tobacco use, specifically in the use of moist snuff among young males (Boyd and Glover 1989; Marcus et al. 1989; Novotny et al. 1989; Rouse 1989; see "Current Use of Smokeless Tobacco" in Chapter 3). The high prevalence of smokeless tobacco use underscores the growing need to help young people quit.

To date, there are few published studies of smokeless tobacco cessation. The withdrawal symptoms for smokeless tobacco are the same as those for smoking—cravings for the substance, irritability, distractibility, and hunger (Hatsukami, Gust, Keenan 1987)—although these symptoms may be less intense and felt less frequently. Because of these similarities, most cessation programs for smokeless tobacco users are multicomponent treatments that use key elements from smoking-cessation programs that have been extensively evaluated in large-scale studies (Severson 1993).

Clinical Studies

Clinical studies of smokeless tobacco cessation have been done with both adolescents and adults. The first published study of smokeless tobacco cessation was reported by Glover (1986), who adapted the ACS' Fresh Start Adult Smoking Cessation Program for use with 41 adults who used smokeless tobacco. This pilot study resulted in a six-month self-reported abstinence rate of only 2 percent. However, these subjects had not voluntarily sought assistance in quitting; they had been required to attend the program for violating school rules at a college that prohibited the use of tobacco products. Low success rates are not surprising in a nonvoluntary cessation program.

Eakin, Severson, and Glasgow (1989) reported an intervention with adolescent male daily users, aged 14 through 18, who were recruited from high schools in Eugene, Oregon. The study recruited 25 students, five of whom also smoked cigarettes concurrently. The program consisted of three small group meetings with counselors, each lasting approximately one hour, during which the focus was on developing coping skills for cessation. Of the 21 subjects who completed treatment, two subjects had quit using smokeless tobacco by the end of treatment, and three subjects were abstinent at the six-month follow-up. Compared with the other students, however, these successful quitters had consumed a smaller amount of smokeless tobacco at baseline and were less addicted, as measured by an adapted Fagerström Tolerance Questionnaire (Fagerström 1978). They were also more involved in school athletics than those who did not succeed at quitting.

School-Based Efforts

Three recent studies of smokeless tobacco cessation are informative about school-based cessation and self-help approaches. Burton et al. (unpublished data) report results from a school-based cessation clinic model tested in 16 high schools in Illinois and California. Within each school, cigarette and smokeless tobacco users were recruited and either randomly (and voluntarily) assigned to a cessation clinic or told the clinics were filled. Clinics consisted of five sessions over a one-month period. A sixth session was held three months later to assess the intervention and control groups. The attrition rate for the clinic group was high: almost half the students did not complete the treatment. Of the 16 smokeless tobacco users who completed five sessions, seven reported quitting at the end of the treatment; none of the five students in the control group reported quitting. However, when the clinic dropouts were included as the denominator and the results corrected for biochemical verification, the quit rate for students in the smokeless tobacco clinic was 15 percent; none of the control subjects had quit at the three-month follow-up. The study suggests that a school-based multisession clinic can achieve small cessation rates for adolescent subjects who volunteer, although the volunteer rates for the study were notably low.

Persons going through treatment for smokeless tobacco addiction often request an oral substitute to help them through withdrawal. Smokeless tobacco users report using cinnamon sticks, gum, sunflower seeds, finely ground mint leaves, or other chewed foodstuffs to lessen the effects of withdrawal (Severson 1992). To evaluate the use of nonnicotine substitutes as aids for smokeless tobacco cessation, a recent study compared the use of a ground-up mint product, chewing gum, and no substitute (Chakravorty 1992). Subjects were recruited from six high schools in rural Illinois. Two schools each were randomly assigned to either the treatment group (mint snuff substitute), gum group, or lecture-only control group. Within schools, smokeless tobacco users were invited to volunteer for a two-session school-based cessation program. Eighty-three males were recruited to participate. Of the 70 students who completed the treatment, 30 were in the mint group, 15 in the gum group, and 25 in the lecture-only group. At the end of the treatment period, all three groups had about the same quit rates. Eleven students reported quitting smokeless tobacco, but nine of these quitters also smoked cigarettes. The author reports that students using the mint snuff substitute significantly reduced their frequency and intensity of smokeless tobacco use, but the study had no biochemical verification of use. The results suggest that adolescent males who use smokeless tobacco can be recruited to attend sessions at school and that nontobacco oral substitutes may be a helpful adjunct to quitting.

Research with adults suggests that health care providers can motivate some adult users of smokeless tobacco to quit (Stevens et al., in press). The clinical opportunity to provide advice on quitting in the context of health care delivery has been referred to as a "teachable moment" (Vogt et al. 1989; Morosco 1986). The results are modest in terms of overall quit rates, but having dentists, hygienists, nurses, and physicians counsel their patients to quit using smokeless tobacco could have a significant effect on prevalence. The Stevens et al. (in press) study provided the first examination of a large-scale, low-cost intervention to encourage smokeless tobacco users to quit. This program, which was conducted in the context of regular hygiene visits, provided strong evidence of the effect of smokeless tobacco use on oral health: 73 percent of the adult users in this study had identifiable oral lesions (Little, Stevens, La Chance, et al. 1992). Parallel studies with youth or studies of programs using physicians or other health care providers have not been conducted.

Smokeless Tobacco and Cigarettes

Young people who use smokeless tobacco may also smoke cigarettes. Studies have reported that from 12 to 30 percent of all regular users of smokeless tobacco also use cigarettes (Eakin, Severson, Glasgow 1989; Williams 1992; Stevens et al., in press; see "Use of Smokeless Tobacco and Cigarettes" in Chapter 3). This relationship is critical, since cessation programs may motivate smokeless tobacco users to quit using snuff or chewing tobacco, yet not affect their use of cigarettes—and thus not affect their addiction to nicotine. Moreover, deprivation of one substance may lead to a direct increase in the use of the other (Biglan, La Chance, Benowitz, unpublished data). Cessation rates among men who use both tobacco products are significantly lower than those among men who use smokeless tobacco exclusively (Stevens et al., in press).

Research and Programmatic Challenges

Certain peculiar aspects of smokeless tobacco use may present problems to those who plan or study cessation programs. The lack of public data on the nicotine content of smokeless tobacco products is not only a research problem but a challenge to cessation efforts that might reduce the severity of nicotine withdrawal by gradually cutting back on nicotine ingestion. Such efforts are further hampered, as are studies or programs depending on self-monitoring of product consumption, by the nonuniform (bulk) packaging of most smokeless products and by the variation in the amount of product that constitutes a "pinch" (of chewing tobacco) or a "dip" (of moist snuff) (Severson et al. 1990.) External monitoring of use also has inherent limitations, since snuff (and to a lesser extent, chewing tobacco) can be used surreptitiously. On the other hand, the oral lesions frequently experienced by smokeless tobacco users readily indicate smokeless use—and provide direct physical evidence to the user that this behavior has detrimental health effects (Little, Stevens, Severson, et al. 1992).

The relationship between smokeless tobacco use and cigarette smoking also presents problems for research and intervention. Because many adolescents perceive smokeless tobacco use to be a safe alternative to smoking, motivation to quit using smokeless tobacco products may be low. On the other hand, because as many as one-third of all smokeless tobacco users also smoke cigarettes, the possibility exists (as was discussed previously) that persons trying to quit using smokeless tobacco may continue to smoke—or even increase their smoking—to minimize nicotine cravings.

Although the preliminary evidence is that cessation rates for smokeless tobacco are similar to those for smoking, the difficulty in recruitment, the small sample sizes, the limited number of studies, the lack of control groups, and the lack of long-term follow-up necessitate cautious interpretation. Further research on cessation must consider the effects of usage frequency and intensity and must focus on relapse rates, use of nicotine replacement in cessation, self-help attempts at quitting, effects of advice by physicians and other health professionals, and effects of taxation and environmental restrictions.

Clinical Interventions to Prevent Tobacco Use

Introduction

Physicians, dentists, and other health care providers who take care of children are in a unique position to help their patients avoid the use of tobacco (Perry and Silvis 1987). Children perceive these professionals as credible health experts and thus may attend more to what they say than to what parents and other adults say. Health care providers can serve as powerful role models who can positively influence the health behavior of their young patients, especially where a long-term relationship has been formed with the child and the family. Lastly, health care providers should know when to provide specific health information at critical times in a child's development.

The medical office provides an important opportunity for physicians, dentists, and staff to communicate attitudes about smoking and smokeless tobacco use (Kottke et al. 1989; Richards 1992). By not smoking, health professionals can serve as positive role models, as the American Academy of Pediatrics (AAP) and the American Academy of Family Physicians (AAFP) have recommended. Smoking by physicians, other staff, adolescents, or parents should not be allowed in the physician's office or reception area (AAP 1987; AAFP 1992).

The AAP recommends that between birth and 21 years of age, a child should make a minimum of 20 visits to the physician (AAP 1988). These visits offer opportunities to prevent and deter tobacco use. To be successful at preventing tobacco use, physicians and other health professionals must know what the risk factors are, how to identify children who are most vulnerable, and how to intervene effectively.

Recommendations to Clinicians Who Care for Children and Adolescents

Education about tobacco should begin in childhood, when family standards and values are developing (AAP and Center for Advanced Health Studies 1988). The child's visit may also afford the opportunity for a health professional to advise young parents who smoke to stop (Perry, Griffin, Murray 1985). During infancy and early childhood, clinicians should emphasize to parents the relationship between environmental tobacco smoke and the infant's health, particularly the association between environmental tobacco smoke and children's pneumonia, bronchitis, asthma, middle ear disease, and sudden infant death syndrome (USDHHS 1986a, 1990a; U.S. Environmental Protection Agency [USEPA] 1992). Advice from a child's physician can reinforce advice that parents may have received from their own doctors. Clinicians thus need to learn skills to promote antismoking behavior and encourage parents to stop smoking.

The NCI and the AAP have developed recommendations for health professionals to prevent their preadult patients from trying smoking (Epps and Manley 1991b). These brief activities can be carried out during the periodic visits that the AAP recommends between birth and 21 years of age, as well as at other visits. Five steps that begin with the letter "a"—anticipate, ask, advise, assist, and arrange follow-up—are recommended:

- *Anticipate* the risks for tobacco use associated with the child's development stage. These risks include exposure to environmental tobacco smoke, experimentation with tobacco, and nicotine addiction (Kandel 1975; Hawkins, Lishner, Catalano 1985; Dent et al. 1987; AAP 1988). Children and adolescents are more likely to use tobacco if their siblings and friends use it and if tobacco use is perceived as normative or functional (USDHHS 1986a; see "Interpersonal Factors" and "Perceived Environmental Factors," both for smoking and for smokeless tobacco use, in Chapter 4). Adolescents are vulnerable to tobacco use—especially those with fewer coping skills (Doueck et al. 1988), those susceptible to cigarette advertising (Blum 1980), and adolescent females concerned about their body weight. (Gritz 1986).

- *Ask* at each visit, about tobacco exposures and tobacco use (Richards 1992). Ask about tobacco use by the patient and by the patient's friends and family. When seeing infants and young children, ask parents whether the patient has regular contact with anyone who smokes. Ask if tobacco use is being discussed among the child's friends or in school and, if so, in what classes. Ask about the child's school health education program. Ask the child about participation in sports and extracurricular activities that may be incompatible with smoking. In dental examinations, inspect the intraoral soft tissue. If changes are noted in the mucosa, ask about smokeless tobacco use.

- *Advise* tobacco users to stop. Advise women of the adverse effects of smoking during pregnancy. Inform smoking parents of the health consequences that environmental tobacco smoke can have on their children. Advise children and adolescents who are using (or even trying) tobacco to stop. Advise smokers of the short-term adverse consequences of tobacco use, such as bad breath, other odors, and the cost of cigarettes. Advise smokeless tobacco users of the potential consequences of use, such as discoloration of teeth, destruction of soft tissue in the mouth, and potential early development of oral lesions and cancers.

- *Assist* tobacco users in stopping. Encourage parents who are trying to quit smoking and help them choose effective strategies to help them quit (Richards 1991, 1992). Assistance for parents or adolescents can include selecting a quit date, providing self-help materials, and in some cases counseling on the use of nicotine replacement (transdermal nicotine patch or nicotine gum) (Glynn and Manley 1989). Help children and adolescents take additional responsibility for their health behaviors. Encourage participation in programs that develop skills for solving problems, setting goals, making decisions, and countering peer pressure (Bingham, Edmondson, Stryker 1984a, b).
- *Arrange* follow-up visits as appropriate. Arrange more frequent follow-up visits for an adolescent who is experimenting with tobacco products. At the first follow-up visit, one to two weeks after a scheduled quit date, discuss progress and problems. Arrange a second visit in one to two months.

The five steps described above should be commonplace in the medical setting. Richards (1992) notes that "the words that a physician chooses to discuss smoking with a patient should be considered no less a therapeutic agent than the pharmacologic agent that the physician prescribes" (p. 687). Yet Frank et al. (1991) found that only 14 percent of smokers aged 12 through 17 years who had seen a physician in the previous year had been advised to quit smoking. In contrast, over 50 percent of smokers aged 25 years and older were advised to quit. Clearly, more consistent advice, concern, and counsel from the medical profession is warranted.

Role of Health Professionals in the School, in the Community, and in Policy Formation

Physicians and other health professionals are often considered leaders in their communities and have the opportunity to mobilize schools and communities to develop tobacco-use prevention, cessation, and policy change strategies. Health professionals who have examined their roles in this larger context should encourage their colleagues to act as advocates for such programs and, if possible, participate in their development or implementation (Shank 1985; AAP 1987; Blum 1992).

Health professionals play a powerful role as sources for nonsmoking advice and assistance, as role models of nonsmoking adults, as providers and supporters of a nonsmoking health care environment, and as agents who deliver nonsmoking programs in schools and communities (USDHHS 1991). Several medical organizations have adopted policies and developed programs to encourage member concern and involvement in preventing adolescent tobacco use. The AMA House of Delegates has adopted numerous policy resolutions that support local tobacco-control activities on behalf of children and others (AMA 1992b). The AAFP (1987) has also published policies and a manual on how to encourage patients of all ages to stop smoking. The AMA Guidelines for Adolescent Preventive Services recently recommended that physicians actively screen and counsel adolescent patients about tobacco use (AMA 1992a). The AAP, with the NCI, has drafted a set of age-specific recommendations for pediatric practice as part of their Tobacco Free Generation program to prevent adolescent tobacco use (Epps and Manley 1991a). The AAP also distributes Healthy Beginning kits developed by the American Lung Association for counseling parents on the harmful effects of smoking around children and distributes pamphlets for parents and adolescents regarding tobacco use (AAP 1988, 1990a, b). The American Academy of Otolaryngology—Head and Neck Surgery, Inc., launched a major public service campaign titled Through with Chew in response to the problem of smokeless tobacco use by youth. The campaign includes a video, a physician volunteer kit to encourage and assist members in community outreach, and a variety of educational aids designed to persuade young men, especially athletes, not to use smokeless tobacco (American Academy of Otolaryngology—Head and Neck Surgery 1992).

Community Programs to Discourage Tobacco Use

Introduction

Community-based strategies to prevent smoking are important adjuncts to school-based programs. Some studies have shown that classroom-based smoking-prevention programs, by themselves, have produced only short-term effects (Lichtenstein et al. 1990; Pentz, MacKinnon, Flay, et al. 1989; Best et al. 1988). These limited outcomes suggest the need to mobilize parents and elements of the community outside the schools to produce lasting behavior change.

Young people who have the highest rates of tobacco use are those least likely to be reached through school programs (Glynn, Anderson, Schwarz 1991). Messages concerning tobacco use will be more acceptable to high-risk adolescents if they are embedded in groups or programs to which these youth already belong, rather than in tobacco-use prevention programs that stand conspicuously apart (Glynn, Anderson, Schwarz 1991). Community organizations and groups, on the other hand, are associated with particular social networks and social groupings of adolescents—potential avenues of program entry to the various social contexts of adolescents' lives.

Such contacts with and through these groups are important, since a strong correlation has been observed between smoking behavior and social group membership among youth (Novick et al. 1985; La Greca and Fisher 1992). The social environment of youth may include strong cues to use tobacco, such as adult role models who smoke or social groups where tobacco use is viewed positively. Community programs can effectively address these environmental elements and disperse messages against tobacco use (Becker et al. 1989; USDHHS 1991). Concerted use of multiple school and community channels for affecting adolescent tobacco-use behavior can produce a synergistic effect on the risk factors associated with adolescent tobacco use (USDHHS 1991).

Information about the programs described in the following sections was obtained through national and regional organizations and published literature. Many other locally initiated programs have been carried out in individual communities throughout the United States, but information on them was not readily available.

Communitywide Research Trials on Smoking Prevention

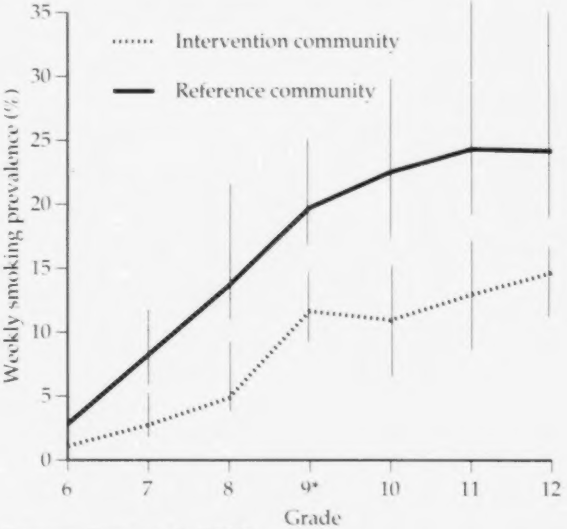
In the last 15 years, several major community-based prevention trials that target youth smoking have been undertaken. Three of these, the Stanford Heart Disease Prevention Program, the Pawtucket Heart Health Program, and the Minnesota Heart Health Program, addressed several cardiovascular risk factors for all age groups and used a variety of community strategies and channels, including school-based programs for youth (Farquhar et al. 1985; Mittelmark et al. 1986; Carleton et al. 1987). Young people therefore received these interventions directly—through school and home-based programs—and indirectly—through a communitywide attempt to structure the overall social and physical environment to support smoking cessation and to discourage young people from starting to smoke. In the Class of 1989 Study, which was part of the Minnesota Heart Health Program, all of the 2,400 students in the graduation class of 1989 in two of the state program's six communities took part in a longitudinal study of health behaviors from 1983 through 1989. In one community, the students also participated in five years of school-based health education, including a peer-led prevention program that addressed social influences to smoke (Perry, Klepp, Sillers 1989). At each of the annual follow-up surveys from 1984 through 1989, youth from the intervention communities had significantly lower smoking prevalences and smoking intensities than youth from the reference communities (Figure 3); at the end of 12th grade, the intervention group had reduced its smoking prevalence by 40 percent (Perry et al. 1992).

Similar results are anticipated from COMMIT, which is a comprehensive, community-based approach to smoking cessation. Though COMMIT's adolescent component is largely limited to the school-based efforts, the program is designed to change the community environment by making smoking a major public health issue and strengthening the social norms and values that support nonsmoking (Thompson et al. 1990–91).

The Richmond Quits Smoking Program tested the communitywide approach in a predominantly black community. Program components, including youth programs, were integrated into existing communication channels and social structures, and the smoking issue was presented in ways relevant to the black community (Hunkeler et al. 1990).

Trials that focus specifically on youth include the Midwestern Prevention Project (MPP), which tested the use of a home- and community-based program in addition to school curricula to prevent the onset of tobacco

Figure 3. Smoking prevalence of the cohort sample, Class of 1989 Study



Source: Perry et al. (1992).

*Smoking prevalence adjusted for false negatives in ninth grade.

use. The overall design of the MPP included all communities within metropolitan Kansas City (Kansas and Missouri) and Indianapolis (Indiana). Within each of these two areas, cohorts of adolescents were assigned by school to intervention or delayed intervention (control) conditions. The intervention programs initially targeted sixth- or seventh-grade students and consisted of a 10-session, school-based social skills curriculum; 10 homework assignments to be completed with parents or guardians; mass media coverage using television, radio, and print; community organization; and policy change. In the first two years of the project, 22,500 adolescents participated in the school and community intervention. Analyses from students in 42 schools (N = 5,008) indicated a lower prevalence of past-month cigarette, alcohol, and marijuana use at one-year follow-up for those exposed to the school intervention than for the control group (17 percent vs. 24 percent for cigarette smoking, 11 percent vs. 16 percent for alcohol use, and 7 percent vs. 10 percent for marijuana use) (Pentz, Dwyer, et al. 1989).

Similar results were observed after two years for a longitudinal panel of students from eight schools in Kansas City (N = 1,122) (Pentz, MacKinnon, Flay, et al. 1989) (Table 6). Third-year results demonstrated sustained impact only on tobacco and marijuana use, but reductions were equivalent for adolescents at lower or higher risk (Johnson et al. 1990). The MPP is particularly important because it demonstrates the feasibility of a large-scale, communitywide effort focused exclusively on youth. The program has also demonstrated impact on those at high risk, and it has considerable methodological strength. The MPP's long-term impact on tobacco is still to be determined.

The New England Research Institute has developed and tested a community program for smoking prevention among Hispanic (Puerto Rican) adolescents. The program includes a music video, buttons and T-shirts, a smoking cessation booklet, information booths and a traveling music show at area festivals, and a basketball tournament that includes a discussion about pressures to smoke (McGraw 1990). The preliminary results of the evaluation, however, indicate no differences between the intervention group (in Boston) and a comparison group (in Hartford) in reported smoking rates, attitudes toward smoking, or intentions to smoke.

Currently under way is Project SixTeen, a community trial being conducted by the Oregon Research Institute from 1990 to 1995. In this project, experimental communities receive a school program combined with community intervention that includes parental involvement, media campaigns, efforts by health care providers, and changes in policies and regulations (Ary and Biglan, unpublished data).

State and Federal Tobacco-Control Efforts at the Local Level

A number of states have adopted tobacco-control programs that include community-based adolescent components. The Association of State and Territorial Health Officials (ASTHO) has recommended the development of statewide tobacco-control plans that include both school and nonschool activities for youth (ASTHO 1989). At least 12 states have developed freestanding statewide tobacco-control plans, and another 22 states have incorporated them into plans for controlling chronic disease (CDC 1991b). All but 15 states have a specific budget devoted to tobacco-related activities. Examples of state-funded nonschool activities to prevent tobacco use include the K.I.D.S. Coalition, a Utah program that encourages youth to work with community leaders to

Table 6. Outcomes of the Midwestern Prevention Project: adjusted net differences in the percentage of smokers in program and control groups, from baseline to 6-month, 1-year, and 2-year follow-up

	Adjusted net difference[*]		
Smoking variable	**6 months**	**1 year**	**2 years**
Lifetime use	2.3	1.2	11.7[†]
Past-month use	-7.5[‡]	-10.2[§]	-16.0[§]
Past-week use	-6.4[‡]	-7.9[‡]	-11.7[§]

Source: Pentz, MacKinnon, Flay, et al. (1989).

[*] Analyses done with school as a unit of analysis, adjusted for race and grade.

[†] $p < .10$ (one-tailed test).

[‡] $p < .05$ (one-tailed test).

[§] $p < .01$ (one-tailed test).

create social change around the tobacco issue (Utah Department of Health 1991), and the Body Guards campaign, a program sponsored by the Minnesota Department of Health that trains minority youth (aged 12 through 14 years) to involve their families and others in the community in tobacco-free pledges and messages (ASTHO 1992).

The Federal Comprehensive Smokeless Tobacco Health Education Act of 1986 (Public Law 99-252), which included a mandate for health education programs and materials about risks of smokeless tobacco, coincided with an increase in state-funded community programs addressing smokeless tobacco. In Ohio, for example, the Department of Health has involved American Lung Association affiliates, Boys and Girls Clubs of America, Little League, the Cleveland Indians baseball team, 4-H Clubs, and juvenile detention centers in efforts to reach youth at high risk of using smokeless tobacco (Capwell 1990).

The most comprehensive state tobacco-control program operates in California. Administered by the state's Department of Health Services and Department of Education, the program has been funded since 1989 by a cigarette excise tax increase of 25 cents per pack (as a result of Proposition 99), one-fifth of which is dedicated to antitobacco education (Bal et al. 1990). Community-based prevention services are specifically directed to high-risk youth (i.e., those who have parents who smoke, those who have dropped out of school, or those who are economically disadvantaged) (Tobacco Education Oversight Committee 1991). During its first two years, this program created local tobacco-use prevention coalitions in all 61 local health jurisdictions, organized a youth summit called Kids Choose a Tobacco Free Future, held training workshops for county staff of the Child Health and Disability Prevention Program to introduce materials and techniques for counseling children and parents about tobacco use, and funded many projects targeting ethnic minority youth and their communities. California Smoke-Free Cities is a joint project sponsored by the California Healthy Cities Project and funded by Proposition 99. This program encourages cities to strengthen local tobacco-control efforts through various activities, many of which include youth (California Smoke-Free Cities 1992).

A community-based program that embraces multiple states and communities is the Planned Approach to Community Health (PATCH), a partnership of the CDC, state health departments, and local communities to plan, carry out, and evaluate programs to prevent chronic disease (USDHHS 1992a). Many of the 19 states and the more than 50 communities that have been involved in the PATCH program have carried out communitywide tobacco-use prevention efforts.

The Center for Substance Abuse Prevention, part of the Substance Abuse and Mental Health Services Administration (SAMHSA), sponsors a program of Community Partnership Grants, in which communities address local drug-use prevention issues. Public Law 102-321, the ADAMHA Reorganization Act, Section 114, provides that all projects funded as prevention, treatment, and rehabilitation model projects for high-risk youth are to include strategies for reducing both tobacco and alcohol use among minors.

The NCI has supported nearly 100 controlled intervention trials aimed at preventing young people from taking up tobacco and helping adult users quit. These trials have involved more than 10 million people in 33 states and over 200 communities in North America; 24 trials specifically targeted adolescents, and 6 addressed the prevention of adolescent use of smokeless tobacco (USDHHS 1990b).

The NCI's American Stop Smoking Intervention Study for Cancer Prevention (ASSIST) is the largest tobacco-control project attempted in the United States. ASSIST is designed to demonstrate that a comprehensive, coordinated intervention effort can significantly reduce smoking and tobacco use. The scientific rationale for this approach was clearly detailed in *Strategies to Control Tobacco Use in the United States: A Blueprint for Public Health Action in the 1990s* (USDHHS 1991).

ASSIST is predicated on a coalition model. During the planning phase, nearly 1,000 community health agencies, social service organizations, and voluntary health groups have joined state and local tobacco-control coalitions. This number will grow as the project enters its intervention phase, when these organizations are expected to begin carrying out interventions targeting youth and other high-risk populations served by these groups. A number of states, including Maine, Virginia, Michigan, Massachusetts, Colorado, and Minnesota, have supplemented their broader statewide coalitions with separate coalitions for controlling tobacco use among youth. Those ASSIST states that have high rates of smokeless tobacco use (West Virginia, Virginia, North Carolina, and South Carolina) specifically address such behavior among both adults and youth in their statewide comprehensive plans.

ASSIST has the potential to save more than 1.2 million lives, including over 400,000 deaths averted from lung cancer alone. The majority of these lives saved would be the direct results of ASSIST's primary prevention efforts among children, adolescent, and young adults.

Community Organizations for Preventing Tobacco Use

Many youth organizations include a programmatic focus on substance use. These program activities may or may not explicitly focus on tobacco separately from other drugs. In most cases, little or no evaluation has been done to measure the effect these programs have on tobacco use.

Project California 4-Health focuses specifically on tobacco and is a joint effort of the University of California at Davis and the University of California Cooperative Extension 4-H programs. The program, which teaches older teens to present a tobacco-use prevention program to youth aged 9 through 12 in settings outside of school, is currently being evaluated (Project California 4-Health 1992).

Two programs are noteworthy because they have been designed to reach high-risk youth. Girls Inc. (formerly Girls Clubs of America) is a nationwide (120-city) network of over 200 centers serving young girls aged 6 through 18; over half of these girls belong to racial and ethnic minority groups. The organization's Friendly PEERsuasion program focuses on avoiding substance abuse (Girls Inc. 1991). Developed under a grant from the Office for Substance Abuse Prevention, Friendly PEERsuasion uses an older-to-younger peer leadership approach to encourage girls aged 11 through 14 to choose healthy alternatives to using illegal drugs, alcohol, and tobacco. The Boys and Girls Clubs of America, a nonprofit organization that provides programs in several areas, including health and physical education, has recently established clubs (built on the structures and supports of the Boys and Girls Clubs of America) in several housing developments around the country. Dubbed the SMART Moves (Self-Management and Resistance Training) program, these clubs aim to prevent substance abuse (including tobacco use) among high-risk youth by also targeting parents and the community (Schinke, Orlandi, Cole 1992).

To counter the association between baseball and smokeless tobacco use, Little League Baseball, Inc., with the support of the NCI and NIDA, has developed for young players two pamphlets that emphasize the negative social consequences of smokeless tobacco. A more extensive program for preventing smokeless tobacco use among youth who are baseball players is currently being evaluated among Little League and Senior League teams in Harris and Galveston counties in Texas (Evans, Raines, Getz 1992). This intervention targets players and their parents and involves professional baseball players.

In 1987, a program developed and implemented in 72 of the 4-H clubs in 24 California counties targeted reduction of smoking and smokeless tobacco use (D'Onofrio, Moskowitz, Braverman, unpublished data). Club members aged 10 through 14 years were involved in the study; 68 percent of the sample were retained at the two-year follow-up. The program included five tobacco-related outcome variables—knowledge, attitudes, perceived social influences, intentions, and behaviors—and involved five sessions of tobacco education provided at the monthly club meetings by volunteers (41 adults and 26 teens) trained to deliver the program. At the first follow-up (one year later), the program demonstrated a significant impact on participants' knowledge of the harmful effects of smokeless tobacco use and on participants' intentions to smoke, but the program had no effect on actual use of smokeless tobacco. The two-year follow-up showed no difference between members of clubs receiving treatment and members of control clubs. The authors concluded that providing a tobacco-prevention program through 4-H clubs was difficult to manage because of time constraints on club meetings, but the effort proved to be a useful complement to school-based programs to change social norms.

Other youth organizations that incorporate tobacco-use prevention as part of a general emphasis on preventing substance abuse include the YWCA (Condas 1992), Camp Fire Boys and Girls (Emerson 1992), the Boy Scouts of America (Grau 1992), and the Girl Scouts of the U.S.A. (Eubanks 1992).

The National Parent Teacher Association (PTA) has adopted a number of resolutions that recognize the hazards of tobacco use and support educational programs and community policies to discourage tobacco use (National PTA 1984). However, the organization's materials for parents about drugs do not discuss tobacco use.

"Just Say No" International is an organization founded in the late 1980s to promote local clubs for youth aged 7 through 14 years. These clubs give children information, skills, and support to help them resist drugs, including tobacco ("Just Say No" International 1992). The parent organization and the 11,000 local clubs are largely funded through private sources and are based in schools and community settings, including some public housing sites. Activities include education, recreation, outreach and peer-education, and community service. An evaluation of 12 local clubs that had been active for at least one year revealed that these clubs can offer young people a meaningful role in improving the community, strengthening community ties, helping community members commit to drug-use prevention, and coordinating other prevention efforts (Duper 1992).

Prevention Programs Initiated by the Tobacco Industry

Since 1984, the Tobacco Institute has distributed a series of publications intended to discourage children from smoking (National Association of State Boards of Education [NASBE] 1984, 1987; Tobacco Observer 1984). Although all of these publications emphasize decision-making skills, only the most recent, *Tobacco: Helping Youth Say No*, actually focuses on tobacco use (Tobacco Institute 1990a, b). The program's cosponsor, The Family COURSE Consortium (Communication through Open minds, Understanding, Respect and Self Esteem) has approached schools and worked with school districts in four major cities to determine the content of their program (Blaunstein 1991). Although promotional materials include testimonials and endorsements, no data concerning the effect of these programs are available.

The first program sponsored by the Tobacco Institute was Helping Youth Decide (NASBE 1984). The program's focus is on parent–child communication skills and responsible decision making (NASBE 1984; Coulson 1985). The program acknowledges that young people should not smoke, but the program itself offers no specific advice on preventing tobacco use (NASBE 1984).

In 1987, Helping Youth Decide was supplanted by Helping Youth Say No (NASBE 1987). Both programs were published in conjunction with NASBE. Like its predecessor, Helping Youth Say No focuses on parent–child communication and on adolescents' decision-making skills. NASBE was criticized by a number of individuals and organizations for its involvement with the Tobacco Institute and eventually ended its association with the program.

The current version of Helping Youth Say No consists of a booklet entitled *Tobacco: Helping Youth Say No—A Parent's Guide to Helping Teenagers Cope with Peer Pressure*. Provided at no charge, these booklets are designed "to increase communication between parents and children and to raise levels of mutual trust and respect." The text discusses the role of peer pressure in young peoples' lives, helps parents talk with their child about not using tobacco, and includes practical exercises to increase parent–child communication. The booklet is likely to appeal to both smoking and nonsmoking parents, since smoking is described as an adult choice (DiFranza and McAfee 1992). This booklet would not likely affect adolescent behaviors because it is directed at parents, who rarely participate in such programs without an incentive (Perry et al. 1989). The materials also do not attempt to set new peer-group norms or encourage peer leadership. Although the program does not specify whether it is to be used as a school-based curriculum, it would not meet the recommended criteria established by the NCI in conjunction with a panel of smoking prevention experts (Glynn 1989; see Table 4).

Prevention Programs Sponsored by Health-Related Organizations

Most of the programs developed by voluntary organizations to prevent smoking among youth are offered as part of a school curriculum. An exception is the American Cancer Society's preschool smoking-prevention program Starting Free—Good Air for Me, which includes various home activity sheets and group activities for preschool settings (ACS 1987). This program was tested among 86 families in four primary care medical settings. Results indicated that children exposed to the program were almost three times as likely as others to report that they intended to protect themselves from adult cigarette smoke (Philips et al. 1990).

The American Lung Association disseminates the Unpuffables, a four-week, home-based program designed to help parents and children aged 9 through 12 years discuss the issue of preventing tobacco use. Pilot tests of the Unpuffables program in schools in Minnesota and Massachusetts and with Camp Fire and YWCA youth groups in Oklahoma showed that parents were aware of and approved of the program (Perry et al. 1990; American Lung Association of Green Country Oklahoma, unpublished data).

The American Lung Association has been active in the area of adolescent smoking cessation. In 1988, a technical advisory group on adolescent smoking cessation reported that demands in this area were unmet and research questions unanswered (Hitchcock 1991). Local affiliates of the American Lung Association have developed one of the few available programs for smoking cessation among adolescents—Tobacco Free Teens, which is used by schools and other organizations in 25 states and 84 local affiliates (Terwedo 1992). A recent, limited evaluation showed lower cessation rates and higher dropout rates than were observed in American Lung Association programs targeting smoking cessation among adults (American Lung Association 1991).

The American Cancer Society, American Heart Association, and American Lung Association joined together in 1988 to launch the Smoke-Free Class of 2000 program. The goal of this education effort is to help the cohort of young people who were first graders in 1988 remain tobacco-free when they graduate in the year 2000. The project reaches about 2 million students and 135,000 teachers nationwide. As students enter junior and senior high school, learning activities will shift from information to community advocacy, creating "youth ambassadors" for a smoke-free society.

Tobacco-Control Advocacy Organizations

DOC, the organization for health professionals that has more than 150 chapters in 23 countries, encourages physicians to counteract the promotion of tobacco to young people (Blum 1980; DOC 1992). Proactive and prohealth strategies in the classroom, clinic, and community use humor and ridicule of tobacco products and tobacco industry messages to call attention to the marketing of tobacco to children. DOC chapters sponsor youth sports teams and leagues with an antitobacco message, support local minority organizations and events such as the Cincinnati Smoke-Free Jazz Festival, and make "housecalls" (protests) at youth-appealing events sponsored by tobacco companies. DOC has also established a program whereby medical students can teach in school-based smoking prevention efforts and become specialists in school and community health promotion (Shank 1985). DOC's leadership in innovative activities has been noted nationally and internationally, and these activities have been replicated or have been the basis for many communitywide programs.

Other tobacco-control advocacy organizations, such as Stop Teenage Addiction to Tobacco (STAT), SmokeFree Educational Services, Inc., and Americans for Nonsmokers' Rights, sponsor many other creative and effective community-based events, chapters, and conferences. Although the results of these organizational efforts are not usually published in scientific journals, their contributions to smoking-prevention programs and policies in the United States are widely recognized.

STAT, for example, is the only organization in the United States dedicated solely to issues of teenage access to tobacco. Public education and information form a major part of STAT's activities. Central to this are the STAT newsletter, the *Tobacco Free Youth Reporter*, which appears quarterly and is sent to over 100,000 persons worldwide. This newsletter, along with STAT-authored journal articles and press advisories and a STAT-sponsored annual conference, has been used to present and analyze the practices of the tobacco industry. Statewide and community projects to reduce sales of tobacco products to youth have also been central to STAT's activities since its inception. Currently, STAT has a major grant from the Robert Wood Johnson Foundation to expand activities related to teenage access to tobacco in communities in four states and to demonstrate how other communities can take similar actions.

The Teens as Teachers program has been created and disseminated by the American Nonsmokers' Rights Foundation. Teens as Teachers reaches young people most vulnerable to tobacco addiction. Although many current smoking-prevention programs do a good job of teaching adolescents how to resist peer influence, Teens as Teachers also teaches them to think critically while examining both the nature of the tobacco industry's strategies and their right to be protected from primary and secondhand smoke. Teens as Teachers has reached over 1,000 high school students, who in turn have reached over 6,000 elementary and middle school students.

Role of the Mass Media in Reducing Tobacco Use

Introduction

Mass media are particularly appropriate prohealth channels for tobacco education among young people, who are heavily exposed to—and often greatly interested in—the media (Minnesota Department of Health 1989). However, although the general public has received many antismoking messages in one form or another since the 1964 Surgeon General's report on smoking and health (Warner 1989), few messages have been designed specifically to prevent young people from trying tobacco.

Programmatic Use of Mass Media to Reduce Adolescent Tobacco Use

By the early 1980s, the Office on Smoking and Health had responded to the lack of media messages discouraging tobacco use among youth by developing a series of national public service announcements (see Table 7). The major voluntary health agencies have also produced a national broadcast message for youth.

DOC began creating counteradvertising in 1977, often involving young people in designing parodies of tobacco advertisements. DOC purchased advertising space, used counterpromotions (e.g., the Emphysema Slims Tennis Tournament) (Solberg 1992), and encountered occasional censorship (Fitzgerald 1990). DOC has maintained visibility by enlisting medical professionals, youth, and parents for innovative media- and community-based antismoking campaigns. The program has not been formally evaluated.

Young people have also been a major (but not exclusive) target group of several important statewide tobacco-use prevention and cessation campaigns. At their onset in the late 1980s and early 1990s, campaigns in Minnesota, Michigan, and California used funds from dedicated cigarette taxes to fund multimedia promotions. The programs have received funding for several years. These states have employed sophisticated marketing techniques (i.e., they have used marketing experts, focus groups, pretesting, pilot campaigns, and ongoing evaluations) to increase their effectiveness and have arranged for extensive paid and donated advertising to ensure adequate reach and frequency of statewide coverage (Minnesota Department of Health 1991; Kizer and Honig 1990). Each of these campaigns also included an outdoor billboard or poster component that mirrored themes in the broadcast media. In 1989, the Michigan Legislature dedicated revenues from a tax on computer software (about $9 million per year) to health promotion, primarily for AIDS and smoking education (Moore &

Table 7. Major mass-media campaigns to prevent tobacco use among young people, United States, 1983–1992

Source and dates Year of survey	Campaign description	Representative spots
Office on Smoking and Health (1983–1990)	A series of TV spots with attractive images of young people dancing or playing sports; the general theme is that living is positive and smoking is out of fashion	Cigarette Mash Nic (A Teen)
National Cancer Institute (1987)	Radio campaign featuring national radio personality Casey Kasem	Smoking's Out
American Lung Association (1988)	TV spot with awareness message	Cigarettes Are Drugs
Michigan Department of Public Health (1988–1992)	TV spots, billboards, and bus cards showing negative social aspects of smoking	Boy Mouth Girl Mouth
California Department of Health Services (1989–1992)	Culturally diverse multimedia campaign to deglamorize tobacco use, reposition tobacco marketers as part of the problem, and inform about the dangers of smoking	Rappers/Pick It Smart Kids Industry Smokesman In Your Mouth
Minnesota Department of Health (1989–1992)	TV, radio, and billboard campaign showing immediate negative consequences of smoking and emphasizing that most young people don't smoke; negative aspects of chewing tobacco shown	Clothes Animals Smoking Crate Death Breath Charming Intro Billy
American Cancer Society (1990)	TV spot showing peer disapproval of smoking	Smoking Is Real Gross
Vermont Department of Health (1992)	TV spots showing positive aspects of not smoking and negative aspects of smoking, showing how to refuse a cigarette, and emphasizing that most young people don't smoke	Mindy at the Party Breakaway Nicoflame Shy Girl Beautiful Lady

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Format and duration (in seconds)	Content
TV (60)	Dancing girls stomp on cigarettes to model quitting; viewers invited to write in for poster
TV (60)	Cartoon of a "butthead" getting shunned by peers
Radio (60)	Smoking portrayed as "out"
TV (30)	A boy in a run-down neighborhood appears to be buying drugs, but it's a pack of cigarettes
TV (15) TV (15)	Quick and humorous messages: smoking stinks!
TV (60)	Fast-paced music video: smoking's not cool
TV (30)	Cartoon: young kids are smart and don't smoke
TV (30)	Tobacco executives joke about "getting" smokers
TV (15)	Disgusting look of a cigarette butt in the mouth
TV (15,30)	Smoking makes your clothes smell
TV (30)	Smoking for animals and people is unnatural
TV (30)	It may look like kids are smoking, but not many do
Radio (60)	A rap song says smoking makes breath smell
Radio (60)	Smokeless: disgusting goo on teeth
Radio (60)	Smokeless: heavy metal tune, chewing isn't cool
TV (30)	Three boys show disgust for a girl's smoking
TV (60)	Situation comedy: it's okay to refuse a cigarette
TV (60)	Rock video: benefits of quitting
TV (30)	Cartoon: drawbacks of smoking
TV (30)	Situation comedy: girl pummels talking cigarette pack
TV (30)	Dramatic — and disgusting: smoking gives you wrinkles

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Associates, Inc. 1990). The Michigan Department of Health invited representatives from television stations and newspapers to participate in the creative process; the multimedia campaign has included paid and public-service broadcast time, as well as space on television, radio, billboards, and buses.

Several other state health departments have developed smaller campaigns. In 1986, Arizona created a smokeless-tobacco-prevention campaign that included a short television message (or "spot"), a series of peer-influence radio spots, a poster, and a ballplayer spokesperson (Arizona Department of Health Services 1986). Indiana created a television spot to discourage smokeless tobacco use (Indiana State Board of Health 1992); a smoking-prevention campaign with monthly broadcast spots was conducted in Alabama (Alabama Department of Public Health 1992); and in Tennessee, a local television spot was used to support the Smoke-Free Class of 2000 school program (Tennessee Department of Health 1992).

State health departments often use advertising agencies and production companies to create their campaign messages. The campaign in Vermont, however, used materials developed previously by other states and by a research grant from the University of Vermont (Flynn et al. 1992). Using focus groups of Vermont children, the Vermont Department of Health pretested the existing materials (including 15-second messages titled "Girl Mouth" and "Boy Mouth") borrowed from Michigan and the "Smoking Is Real Gross" spot produced by the ACS. The spots that were rated highest by the focus groups were included in Vermont's 1992 statewide campaign.

Most of the major mass-media campaigns listed in Table 7 employed social influence strategies similar to those that were successful in school-based smoking-prevention programs. The California campaign, however, focused more on information-based approaches and most prominently on a strategy to deglamorize tobacco use by exposing the business side of the tobacco industry and by repositioning tobacco marketers as playing a significant role in the problem of adolescent tobacco use (Kizer and Honig 1990). Messages alerting young people to the negative impact of tobacco promotion were also included as a part of research-oriented campaigns (discussed later in this section) in Richmond, California (Hunkeler et al. 1990), and in Vermont (Flynn et al. 1992), but results have not yet been published about the effectiveness of these specific messages. It has yet to be established that making young people aware that they can be vulnerable targets of tobacco advertising contributes to smoking prevention (McKenna and Williams 1993).

Theory and Research on Using Mass Media to Reduce Adolescent Tobacco Use

During the past 20 years, various ideas have emerged on using mass media effectively to prevent the onset of tobacco use or bring about its cessation among young people. An important article by Flay, DiTecco, and Schlegel (1980) expanded previous information-based models to include new elements that would increase the likelihood of promoting and maintaining health behaviors through the mass media. These elements included techniques to ensure that messages are attended to, comprehended, and accepted, as well as techniques to convey skills, stimulate social interaction, and reinforce behavior. Schilling and McAlister (1990) integrated social and behavioral research and theory into media-based prevention strategies for tobacco and drug use. Further, DeJong and Winsten (1990) incorporated more developed principles of social marketing and experiences of researchers and other practitioners in health promotion and commercial marketing to present a detailed set of recommendations on the use of mass media to prevent substance abuse.

As in the case of national campaigns, research on the use of mass media to bring about the prevention or cessation of tobacco use among young people has been sporadic and may warrant further commitment at the national level (Bauman 1992). The best-organized research effort was coordinated in the mid-1980s through the NCI's Smoking, Tobacco, and Cancer Program (Bettinghaus 1988). Three research grants coordinated by this program tested approaches for using mass media for smoking prevention and cessation among young people.

The first of these studies, at the University of Southern California (Flay et al. 1988), evaluated a strategy developed in previous projects. In that strategy, school-based programs that emphasized skills to resist social influences to smoke were extended to include segments on southern California's evening news broadcasts (Sussman et al. 1987). Although school programs were effectively carried out, the television segments were not able to meet the objectives of the study, because the commercial news organization and its labor contracts did not allow the newscast to include scripted demonstrations of prevention skills. Researchers from the university were not able to participate in the production process, nor were they able to pilot-test the television segments. The authors conclude that "the resulting programming did not demonstrate social resistance skills in the progressive and detailed way that is necessary for adequate learning to take place" (p. 604).

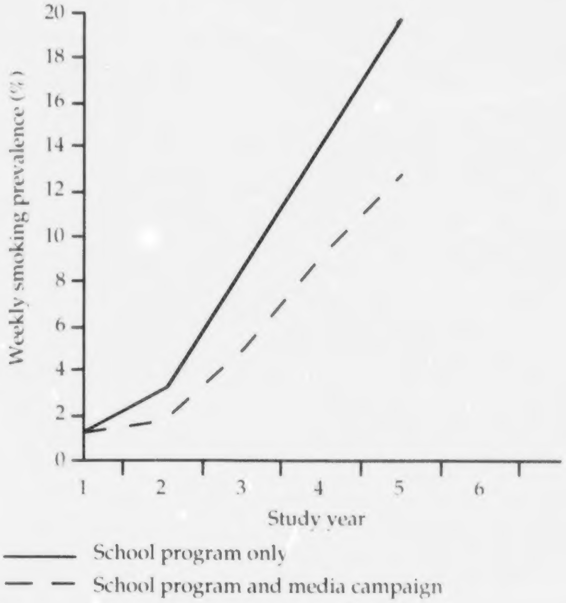
The second study, at the University of North Carolina at Chapel Hill (Bauman et al. 1988), used contemporary marketing techniques coupled with behavioral science theory to develop three campaigns that could be practical and inexpensive enough to be disseminated nationally if proven successful. A radio campaign used eight messages about expected consequences of smoking. Another radio campaign invited young people and their friends to enter a sweepstakes by pledging not to smoke. Lastly, a television campaign combined these two approaches. These campaigns were conducted as paid media, not as public service announcements. The intervention, which involved 10 media markets in the southeastern United States, was expected to reach 75 percent of its adolescent target audience during 1985 and 1986. Although none of these campaign approaches resulted in reductions in the onset of smoking, improvements were observed in two important psychosocial factors—the expected utility of smoking and friends' approval of smoking (see "Social Support for Smoking" and "Subjective Expected Utility" in Chapter 4). The authors also found that radio was as effective as television for reaching the adolescent audience (Bauman, Padgett, Koch 1989; Bauman et al. 1991).

The third study, at the University of Vermont (Worden et al. 1988), tested the ability of mass media interventions to increase the efficacy of a school-based smoking-prevention program. In this intervention strategy, media and school programs shared educational objectives but were otherwise independent. A total of 36 television and 17 radio messages were developed by using extensive diagnostic and formative research with students in grades 4 through 10. The messages were broadcast in a four-year paid campaign in cities in Montana and the northeastern United States from 1986 through 1989. Results indicated that the smoking prevalence for students who received both the media campaign and the school program was 34 to 41 percent lower than for students who received the school program only (Figure 4). The study observed consistently positive results for intervening measures (Flynn et al. 1992). An alternative approach that used the community as the unit of analysis also showed a significant difference between treatment groups over time (Flynn et al. 1992). This campaign used various message formats and production styles, including nonauthoritarian appeals that avoided direct exhortations not to smoke. The authors suggested that because the media campaign was not explicitly linked to the school program (e.g., the two components did not share materials, designs, or slogans), adolescent viewers may have perceived that young people across the nation were receiving the same nonsmoking messages—and that nonsmoking was indeed the norm.

Other than the three studies funded by the NCI, little mass-media research has been directed at adolescent smoking. The recent California mass media campaign included young people as a major target audience; about one-third of the television messages, one-quarter of the radio messages, and over one-half of the outdoor advertisements addressed young people as well as other specified groups (e.g., pregnant women, young adults, adults) (Kizer and Honig 1990).

Although the goals of the California campaign intermingle youth and adult priorities, the goals that seem to apply to youth are those that deglamorize the myths about tobacco use, expose problems created by the tobacco industry, and provide information about the hazards of smoking. A few spots touch on these topics (Table 7), but several others, said to be targeted to the youth audiences in the California media plan, seem to be intended for adults, such as spots about youth access to cigarette vending machines and about spots that show children worrying about their parents' smoking. Measurements before and after campaign waves, however, indicated significant changes in message awareness (Popham et al. 1991), and a report by Glantz (1993) indicates an association between the media campaign and a decline in cigarette consumption throughout California. Recently released data suggest, however, that this decline is not being observed among youth (Pierce et al. 1993).

Figure 4. Smoking prevalence in University of Vermont program using mass media to prevent adolescent smoking



Source: Adapted from Flynn et al. (1992).

Mass media were also used in the Midwestern Prevention Project, a multicomponent community program (Pentz, MacKinnon, Dwyer, et al. 1989) in Kansas City in 1987, but effects of the media were not assessed separately. An evaluation of the statewide Minnesota campaign indicated that youth were aware of the negative personal and social consequences of smoking and could recall two campaign themes—that "smoking is unnatural" and that "not many kids my age smoke" (Minnesota Department of Health 1991). Mass media were also an integral part of a community-based smoking-cessation program for minorities in Richmond, California, in which billboards, bus posters, direct mail, television, coverage on a national evening television news show, and rap music video presentations supported community program activities. Both participation and awareness were high among these minority youth, although summary results have yet to be reported (Hunkeler et al. 1990).

Effective Designs for Mass-Media Campaigns

Although mass media in the United States have been used to convey messages urging youth not to use tobacco, efforts to use the media for this purpose have been meager when compared with the highly coordinated, well-funded campaigns of tobacco advertisers. In the absence of a national campaign against tobacco use, with coordinated themes and paid counteradvertising, state agencies and voluntary organizations have launched short-term efforts that have had limited evaluations of their impact. Research on the potential uses of the media has been restricted to a few experimental studies using divergent media strategies, and only one of the studies has resulted in a significant reduction in smoking among adolescents (Flynn et al. 1992).

Although a national commitment to using mass media to prevent tobacco use among youth has been limited, sufficient evidence now exists to examine this tactic further. The effectiveness of a large-scale mass-media and school-based program has been demonstrated in the University of Vermont study (Flynn et al. 1992), albeit with largely white student populations in northern states. In addition, several applicable principles of effective campaign design have been identified within the disciplines of marketing, advertising, health education, and the social sciences (Flay, DiTecco, Schlegel 1980; Flay 1986; Schilling and McAlister 1990; DeJong and Winsten 1990; Flay and Burton 1990; Flynn et al. 1992). These principles, which are discussed below, can be applied to future mass media programs for young people.

- In planning campaigns to prevent tobacco use, target groups should be carefully differentiated. If a campaign is aimed at youth only, it may be best to separate it from community or school ties and to use media and message formats that appeal to youth only (Flynn et al. 1992). Even within the youth population, segmentation (e.g., by age, gender, racial/ethnic group) may be necessary. If the campaign is community based, either for youth or their parents, it should closely connect with community resources and appeal specifically to either the youth or the parent target group—not to both (Hunkeler et al. 1990).

- The planning of prohealth campaigns for young people should attend to the critical issues of message design identified in the literature (Flay, DiTecco, Schlegel 1980; Flay 1986; Schilling and McAlister 1990; DeJong and Winsten 1990; Flynn et al. 1992). These issues include appealing to the needs and interests of the target group (e.g., peer approval, freedom, autonomy); using peer models, image appeals, or lifestyle appeals instead of cognitive appeals; providing novelty and humor (Blum 1980); avoiding exhortation; using celebrity spokespersons cautiously; and demonstrating preventive skills.

- Messages should be carefully scrutinized by knowledgeable persons and by representatives of target groups to ensure that these messages are not conveying unintended effects that may eclipse their positive value (Flay and Burton 1988). Antismoking messages that show young people smoking or asking someone for a cigarette may unintentionally employ powerful images of the social functions of smoking, particularly if the supposedly negative role model is in any way attractive or appealing to the target audience. These images may greatly outweigh the impact of a voice-over narrator's message—a message that could be almost meaningless to the image-oriented target group of young people.

- Diagnostic and formative research, including surveys and focus groups, should be employed at appropriate points throughout the creative process. Diagnostic research can identify perceptions and needs in the target audience that are critical for concept development (Worden et al. 1988). Formative research, at both preliminary and advanced stages of message execution, avoids potentially damaging, unintended message effects (Flay and Burton 1988) and gives producers confidence that the message will be accepted and appreciated by the target audience. Pretesting during the execution phase is critical for messages aimed at youth, because much of the message appeal relies on production elements such as choice of actors, clothing, and music. To be successful, production need not be costly (Flynn et al. 1992). In fact, small, independent producers may be preferable if production quality is maintained.

- Campaigns should be intense enough to ensure impact (Flay, DiTecco, Schlegel 1980). Television messages should be aired at times when young people are most likely to be watching—and for best efficiency, at times when they are the primary viewers, particularly during the reruns of popular prime-time shows during after-school hours, since these shows tend to charge relatively low rates for advertising. Adequate reach and frequency should be achieved by using both paid and public-service time (Erickson, McKenna, Romano 1990). The statewide media campaigns in California, Minnesota, and Michigan are based on paid advertising funded by earmarked taxes. Paid media appear necessary to achieve substantial exposure to targeted youth populations at optimal times of the day. Campaigns should have sufficient duration (or else should run continuously) to impact youth throughout the critical years for smoking onset (Worden et al. 1988).
- Campaigns can be cost-effective. Evidence from the University of Vermont study (Flynn et al. 1992), which achieved a 35 percent reduction in weekly smoking, indicated that the cost per person for the estimated 2,605 young people (7 percent of the total population aged 10 through 15 in the broadcast area [U.S. Department of Commerce 1992a, b, c; R.R. Bowker 1992]) who may have been prevented from smoking by the four-year intervention was estimated to be $233 when the costs of production and paid advertising were included, and $77 when paid advertising alone was included. These costs compare favorably to those incurred in various smoking cessation programs (Altman et al. 1987), in which costs ranged from $22 to $339 per successful quitter. For the estimated 37,212 students in grades 5 through 10 residing in areas receiving this media campaign, the annual cost per student for the total campaign was $4.08; for paid advertising only, the cost per student was $1.34. Comparable total campaign costs per teenager in Minnesota, with a 95 percent audience reach but fewer exposures than in the Vermont study, were $1.07 in 1989 and $1.14 in 1990 (Culley 1992). Costs can also be contained if media spots are shared across states or reused after several years.

Public Policies to Prevent Tobacco Use Among Young People

Effect of General-Public Smoking Restrictions on Young People

Introduction

Public smoking restrictions are an important component of the social environment that supports nonsmoking behavior (Rigotti 1989; Simonich 1991; Wasserman et al. 1991; Emont et al. 1993). They contribute to adolescents' perceptions that nonsmoking is normative and create a social climate where smoking is not acceptable. Restrictions convey the additional message that smoking creates health problems for smokers and nonsmokers alike. Finally, relative to the degree of compliance, these restrictions reduce the number of opportunities to smoke and thus make smoking less convenient. The net effect of these restrictions should be to reduce the psychosocial benefits of smoking to adolescents, making it less likely that those who experiment with smoking will continue to smoke and become dependent (USDHHS 1991).

History of Public Smoking Restrictions

As documented in the 1986 and 1989 Surgeon General's reports on smoking and health, restrictions on smoking in public before the 1970s were motivated primarily by concern over smoking as a potential fire hazard and by other safety concerns, such as distractions while driving (USDHHS 1986a, 1989). In the 1970s, new legislation was enacted, principally in the form of state-level clean-indoor-air acts, to protect the nonsmoking public from the health hazards and physical irritation caused by smoking. During the 1970s, 31 states passed legislation that introduced restrictions on smoking in public places and private facilities, such as workplaces or restaurants, or that extended existing regulations (USDHHS 1989). This and ensuing legislation was fueled by the accumulation of well-documented, well-publicized evidence of the disease risks associated with smoking (Rigotti 1989; USDHHS 1991). During the 1980s, tobacco-control efforts spread to the local level. By 1990, a total of 45 states, the District of Columbia, and at least 51 percent of cities with a population of 25,000 or greater had adopted some restrictions on smoking in public places (Rigotti and Pashos 1991; Coalition on Smoking OR Health 1992). However, only a fraction of these laws could be considered comprehensive enough to provide meaningful protection against environmental tobacco smoke, and municipal laws have tended to be more extensive and stronger than state laws (Rigotti and Pashos 1991; USDHHS 1991). The 1990s have seen the introduction of bills sponsored by the tobacco industry that include limited state restrictions on smoking in public but that also preempt more restrictive current or subsequent local ordinances. States with complete or partial preemption include Florida, Pennsylvania, Virginia, Nevada, Illinois, New Jersey, Iowa, and Oklahoma (Rigotti and Pashos 1991; Americans for Nonsmokers' Rights 1992c).

Smoking Restrictions in the School

Schools can create powerful environments for promoting a nonsmoking norm. Educational organizations such as the National School Boards Association ([NSBA] 1987, 1989) and the Alliance for Health, Physical Education, Recreation, and Dance (1991) have endorsed the use of "tobacco-free policies" as a key component of efforts to create smoke-free schools.

In 1988, the NSBA, in collaboration with the ACS, the American Heart Association, and the American Lung Association, conducted a random-sample mail survey of school smoking policies in 2,000 of the more than 15,000 public school districts in the United States; 1,310 (66 percent) of the districts responded (NSBA 1989). Results from a similar, earlier NSBA study (NSBA 1987; USDHHS 1991) allowed an examination of policy trends over time. In 1988, 95 percent of all responding school districts had a written policy or regulation on tobacco smoking in schools. All of the written policies in the 1988 survey included restrictions on smoking by students; 96 percent addressed smoking by faculty, staff, and administration; and 92 percent addressed smoking by other adults. Of the districts responding to the 1988 survey, 17 percent totally banned smoking; that is, smoking by anyone was prohibited both on school premises and at school functions. Restrictions on adult smoking on school premises and at school functions more than doubled during the two years separating the surveys. For example, the proportion of districts that prohibited smoking by school personnel in school buildings increased from 11 percent in 1986 to 24 percent in 1988. In the 1988 survey, compliance by school personnel was described as "excellent" or "good" by 87 percent of districts with written policies, and 86 percent reported similar levels of compliance among students. Moreover, school districts with policies that banned smoking altogether reported greater adherence to their policies than did districts with less stringent restrictions.

In October 1989, ASTHO conducted a survey of state health department personnel that included information on policies that address tobacco use (CDC 1991b). Thirty-nine states were found to have state-level regulations that restricted tobacco use in schools. Twenty-seven states banned smoking for students; eight states banned smoking for both students and staff (CDC 1991b). Since that survey, at least two more states have passed laws that prohibit any tobacco use in their schools.

Research on topics such as the effect of school smoking-restriction policies on student and adult tobacco use, attitudes toward tobacco use, and compliance with policy remains limited. Reports from national surveys (NSBA 1989) and from schools within Minnesota (Minnesota Department of Health 1991) indicate that restrictive smoking policies can gain widespread support and acceptance. Since 1985, Minnesota school districts have participated in intensive efforts to reduce tobacco use among adolescents (Griffin, Loeffler, Kasell 1988). Since beginning these efforts, the number of Minnesota school districts with tobacco-free policies for students, staff, and visitors increased from 3 to 361 school districts (83 percent of all districts). In May 1989, the Minnesota Department of Health conducted a survey in districts that had a tobacco-free policy in place for six or more months. Survey results indicated that a large majority of school districts had experienced broad acceptance and support for tobacco-free policies, a large number of perceived benefits, and few problems. For example, 62 percent of the districts reported having no problems implementing their tobacco-free policies, and 98 percent of all tobacco-free districts reported that they did not intend to weaken their policy (Minnesota Department of Health 1991).

Pentz, Dwyer, et al. (1989) examined the impact of school smoking policies on over 4,000 adolescents in 23 schools in California. The schools' written smoking policies were evaluated on whether they banned smoking on school grounds, restricted students from leaving school grounds, banned smoking near school, and included an education program on smoking prevention. Schools that had policies in all of these areas and emphasized prevention and cessation had significantly lower smoking rates than did schools with fewer policies and less emphasis on smoking prevention.

Drawing on reviews of existing policy and on preliminary evaluative research, several authors (Rashak et al. 1986; Brink et al. 1988; DiFranza 1989; NSBA 1989) have identified the following characteristics of effective school smoking policies.

- Smoking on school grounds, on school buses, and at school-sponsored events is prohibited for students, school personnel, and visitors.
- Schools vigorously enforce the policy and consistently administer penalties for violations.
- Disciplinary measures for noncompliance with policy are educational as well as punitive.
- Policy development includes active collaboration with teacher, student, and parent groups to give direction and build support for tobacco-free schools.
- All components of a school's smoking policy, including consequences for violations, are communicated in written and oral form to students, staff, and visitors.
- Districtwide educational programs addressing the prevention of tobacco use are initiated or expanded as part of the policy implementation process.
- Smoking-cessation programs or other incentives are developed for students, school personnel, and if possible, the public.
- Programs are periodically evaluated to provide information on acceptance and effectiveness of policy.
- Schools do not accept any contributions from the tobacco industry, including direct financial support and materials paid for by, or produced by or for, the tobacco industry.

Other Public Smoking Restrictions That Affect Youth

Smoking or tobacco use by minors (as opposed to the selling of tobacco products to minors) is prohibited by at least 21 states (USDHHS 1992b). In general, these laws are remnants of a previous era of smoking restrictions; for example, the Minnesota law dates back to the early 1900s (Minnesota Statutes Annotated 1987). Such laws are rarely enforced except when young people congregating to smoke constitute a nuisance.

Few smoking restrictions, other than school policies, are adopted specifically because of their effect on children. Major exceptions include restrictions on smoking in daycare facilities and restrictions on smoking by minors. In August 1992, legislation was introduced by U.S. Representative Richard Durbin and U.S. Senator Frank Lautenberg that would require federally funded programs to establish a nonsmoking policy wherever they provide direct services to children under age five (U.S. Congress 1992).

Restrictions on daycare facilities in particular are important because it has been estimated that in 1988, 13 percent of U.S. children aged five years and younger (about 2.8 million) were being regularly cared for by a nonrelative in a home or facility other than the child's home (Dawson and Cain 1990). As of July 1992, 40 states restricted smoking to some extent in child daycare facilities, but only Alaska, Arkansas, Michigan, and Minnesota required at least one category of daycare facility to be smoke-free indoors (Coalition on Smoking OR Health 1992; Nelson, Sacks, Addiss 1993). In Minnesota, however, these laws apply only to licensed daycare centers and do not extend to licensed or unlicensed family daycare homes. In a 1990 national survey of licensed daycare centers, nearly 55 percent of centers reported that they were smoke-free indoors only; another 26 percent were smoke-free indoors and outdoors (Nelson, Sacks, Addiss 1993). Other public smoking restrictions are relevant to children because young people frequent specific locations and are influenced either directly by a law or policy, or indirectly by the norms of these institutions, including sports facilities, restaurants, and shopping malls.

Smoke-free sports facilities help break the connection between tobacco and sports that has been fostered by the tobacco industry (see "Public Entertainment" in Chapter 5). The directors of many university and professional-league stadiums and arenas have voluntarily made their facilities smoke-free. These facilities include Oriole Park at Camden Yards in Baltimore, Maryland; Tiger Stadium in Detroit, Michigan; the Hubert H. Humphrey Metrodome in Minneapolis, Minnesota; Texas Stadium in Irving, Texas; and basketball arenas in Phoenix, Arizona; Salt Lake City, Utah; and Minneapolis, Minnesota (Americans for Nonsmokers' Rights 1992a, b, c). At least 23 states restrict smoking in gymnasiums or arenas as part of their legislation for clean indoor air (Coalition on Smoking OR Health 1992).

Restaurants are among the most frequented public facilities in the United States, and some restaurants make specific marketing appeals to children or adolescents (Simonich 1991). By 1989, 44 states had included some restrictions on smoking in restaurants, and 51 percent of cities with a population of 25,000 or greater had passed local ordinances restricting smoking in restaurants (Coalition on Smoking OR Health 1992; Rigotti and Pashos 1991; Americans for Nonsmokers' Rights 1992a). The 1992 publication of the Environmental Protection Agency's findings on the effects of environmental tobacco smoke on children have led to calls for fast-food restaurants to eliminate their smoking sections (Melamed 1992; Action on Smoking and Health 1992); several have responded with pilot programs.

A new ordinance (effective since June 1992) that prohibits smoking in enclosed private malls in Howard County, Maryland, is believed to be the first of its kind in the United States (SmokeFree Educational Services, Inc. 1992). However, in Minnesota and elsewhere, a number of malls have recently voluntarily adopted smoke-free policies (O'Brien 1991). Maine, New York, and Washington State specifically mention shopping centers in their legislation for clean indoor air (Coalition on Smoking OR Health 1992). As public places, shopping malls should be subject to existing state and local restrictions on smoking in public places, but the extent to which such laws are enforced for these facilities is unknown.

Effect of Smoking Restrictions on Adolescent Tobacco Use

Rigotti and Pashos (1991) concluded that an inverse relationship exists between smoking restrictions and smoking rates; the direction of causality, if any, between smoking rates and smoking restrictions could not be determined from the evidence available. Additional evidence is provided by two recent econometric studies. Simonich (1991) modeled actual cigarette consumption per capita for ages 14 and older as a function of price, income, advertising, and product differentiation; the model also included the nicotine content of cigarettes. The data set consisted of quarterly per capita consumption from 1959 through 1983. Simonich (1991) concluded that each time the proportion of all smokers in the United States who lived in states with smoking restrictions on restaurants or workplaces increased by 10 percent, the consumption of cigarettes would decrease by 6.5 percent. A study by Wasserman et al. (1991) specifically examined teenage cigarette smoking. Smoking data from the Second National Health and Nutrition Examination Survey were used to determine cigarette consumption. A state regulation index was constructed that was similar to one described in the Surgeon General's 1986 report on smoking and health (USDHHS 1986a). Teenage cigarette demand was modeled using price, the regulation index, and a series of covariates. These analyses showed that restrictive smoking regulations have a significant effect on teenage cigarette consumption; in fact, the effect is stronger for teenagers than for adults. The authors estimated that if the average score on the regulation index were to increase to the highest level (smoking restricted in private worksites), teenage cigarette consumption would decline by 41 percent. These researchers concluded from data on smoking prevalence that smoking regulations are most effective in preventing teenagers from starting to smoke, rather than in reducing their consumption.

Restrictions on Minors' Access to Tobacco

Introduction

Reducing the availability of tobacco to minors is important for a number of reasons. Making tobacco more difficult to obtain makes it less likely that young persons experimenting with smoking will graduate to addiction. Adding legal sanctions to the purchase of tobacco will deter those young persons who are unwilling to break laws to obtain tobacco and will add to the perceived social unacceptability of tobacco use. Two cross-sectional studies provide preliminary evidence that suggests a negative relationship between tobacco access and tobacco use among young people (Jason et al. 1991; DiFranza, Carlson, Caisse 1992). Controlling the sale of tobacco to minors emphasizes the dangerous nature of tobacco products and places tobacco appropriately in the category of regulated products. These measures also reinforce and support the messages about tobacco that young people receive in school and other settings.

Tobacco Sources for Youth

When tobacco access laws are not enforced, young people purchase cigarettes from all available sources. Nearly all teen smokers have purchased a pack of cigarettes at least once (Gallup Organization 1993). The majority of minors who smoke purchase their own cigarettes. Small stores and gas stations are the major source of cigarettes for underage buyers; vending machines are more popular among the youngest adolescents; and the majority of adolescents who have never smoked believe it would be easy for them to buy cigarettes (Forster, Klepp, Jeffery 1989; Nova Scotia Council on Smoking and Health 1991; CDC 1992b; Gallup Organization1993).

Vending machines provide an easy, if comparatively expensive, source of tobacco for young people. Tobacco industry figures show that in 1988, vending machines sales accounted for only 4 to 8 percent of all cigarettes sold, but young people tend to use vending machines more often than the general smoking public (National Automatic Merchandising Association 1989). Vending machines were either often or sometimes used by 38 percent of ninth-grade daily smokers in the COMMIT survey (Cummings et al. 1992). In a Minnesota survey, 53 percent of 10th-graders who were weekly smokers reported that vending machines were a major source of their cigarettes (Forster, Klepp, Jeffery 1989). In the TAPS, vending machines were either often or sometimes used by 20 percent of 12- through 15-year-old smokers but by only 12 percent of 16- and 17-year-olds (15 percent overall) (CDC 1992b). Vending machines were also used more frequently by younger smokers in a mall-intercept survey (conducted for the vending machine association) of 1,015 smokers aged 13 through 17 (National Automatic Merchandising Association 1989); only 2 percent of the 17-year-old smokers used vending machines, whereas 22 percent of the 13-year-olds did so (Response Research, Inc. 1989). However, a survey of

Canadian children found that those over 15 years old were more likely than younger children to use vending machines (Nova Scotia Council on Smoking and Health 1991).

Adults can be a source of tobacco for some adolescents. In the COMMIT survey of ninth-grade smokers, 17 percent indicated that they usually obtained their cigarettes from parents or other adults (Cummings et al. 1992). In a Canadian study, 25 percent of smokers aged 11 through 15 years had obtained tobacco from parents or guardians (Nova Scotia Council on Smoking and Health 1991). These figures do not discriminate between adults' intentionally supplying minors with tobacco and young persons' stealing cigarettes from adults.

Tobacco also may be obtained without purchase. In a survey of elementary and high school students in Chicago, 14 percent had received free tobacco samples on at least one occasion (Davis and Jason 1988). In a survey of 1,692 Georgia students in grades 7 through 12, about 5 percent of the students reported shoplifting cigarettes in the preceding 12 months (Cox, Cox, Moschis 1990).

Studies of Young People's Access to Tobacco

Since 1987, 13 studies have examined the degree to which minors could purchase cigarettes from retail establishments. Eight of those studies investigated purchases from vending machines as well as purchases from over-the-counter outlets; one additional study investigated sales through vending machines only.

In the 13 over-the-counter studies, illegal sales to minors ranged from a low of 32 percent in Kansas to a high of 87 percent in both South Dakota and Oregon; the approximate weighted-average was 67 percent across all studies (Table 8). The 13 studies indicated that minors' ability to purchase cigarettes is a function of the young people's gender and actual or perceived age, the statutory age of legal sale, and the community's previous enforcement activities. Although the range of noncompliance to age laws is wide, the majority of minors were able to buy cigarettes in all studies except those conducted in Kansas (32 percent were able to buy) and Missouri (46 percent were able to buy). Similar rates of noncompliance have been observed for smokeless tobacco use in one recent study (CDC 1993).

Of the nine studies that examined vending machine sales, illegal sales ranged from 82 to 100 percent; the approximate weighted-average rate of illegal sales was 88 percent (Table 9). Besides providing baseline data, six of the 13 over-the-counter studies and five of the nine vending machine studies also evaluated the effectiveness of various enforcement strategies. The majority of studies had a significant impact on minors' ability to purchase cigarettes: the ability to buy decreased from a minimal reduction of 14 percent during six months following an educational program, to a maximum reduction of 93 percent during 18 months following a program of "stings," licensing, and fines (Table 8). Although an average rate of reduction (relative change) is difficult to calculate precisely, various enforcement strategies appear able to reduce the rate of illegal over-the-counter sales from 20 to 40 percent in less than a year.

Of the five studies that evaluated the effectiveness of restrictions on the sale of cigarettes through vending machines, the results are less clear (Table 9). In some instances, educational programs coupled with licensing and fines resulted in reductions in sales, while in other cases these tactics had no effect. In Minnesota, some success followed the passage of a local ordinance requiring locking devices that must be inactivated by an employee before a purchase can be made through a vending machine; results were more significant, however, when vending machines were entirely banned.

State and Local Laws Regarding Tobacco Distribution to Minors

A number of state and local laws legally restrict minors' access to tobacco, and legislative activity in this area is increasing (CDC 1991b; Coalition on Smoking OR Health 1992). All 50 states and the District of Columbia have adopted a minimum age of 18 for the sale of tobacco. Only Virginia does not also restrict the distribution of samples of tobacco products. Thirty-one states require vendors to have a license to sell tobacco products; 14 of these will revoke such license as a penalty for noncompliance, and only eight actually provide for an enforcer (USDHHS 1992b).

Over the past three years, cigarette sales through vending machines have been targeted as sources of tobacco for young people. Vending machines suggest a universal availability of cigarettes in our society, and their presence may discourage merchants from making efforts to control over-the-counter cigarette sales to minors. Because vending machines are self-service, it is difficult to attach responsibility and liability to a particular individual for illegal sales to minors from vending machines, and employees may not feel the same responsibility they might for over-the-counter sales.

Twenty-one states and Washington, D.C., have passed laws restricting vending machine sales (USDHHS 1992b). A rapidly growing number of cities have restricted this method of sale, and at least 30 cities in Minnesota, New York, California, Maryland, New Jersey, and Louisiana have totally banned cigarette vending machines (Coalition on Smoking OR Health 1992). Much of this activity has occurred since October 1989, when

Table 8. Published studies examining over-the-counter cigarette sales to minors, United States, 1989–1993

Study and location	Number of stores or attempts	Baseline sales rate (%)	Follow-up sales rate (%)	Relative reduction in successful tries by minors (%)	Time period
Altman et al. (1989) California	412	74	39	-47	6 months
Skretny et al. (1990) New York	62 intervention, 58 control	NA NA	77 86	-10*	2 weeks
Feighery, Altman, Shaffer (1991) California	approx. 169 (see comment)	72	62 21	-14 -71	6 months 11 months
Jason et al. (1991) Illinois	20–30	60–70	36 3	-40 -93	3 months 18 months
Altman et al. (1991) California	97	76	59	-22	12 months
Forster, Hourigan, McGovern (1992) Minnesota	301	53	38	-28	3 months
DiFranza et al. (1987) Massachusetts	93	63	NA†	NA	NA
Nelson, Marso, Roby (1989) South Dakota	30	87	NA	NA	NA
Thomson and Toffler (1990) Oregon	66	87	NA	NA	NA
Centers for Disease Control [CDC], (1990) Colorado	97	55	NA	NA	NA
Hoppock and Houston (1990) Kansas	67	32	NA	NA	NA
CDC (1993) Missouri	89	46	NA	NA	NA
CDC (1993) Texas	94	63	NA	NA	NA

*Not statistically significant.

†NA = Not available.

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Enforcement method	Comments
Community education, direct education of merchants, contact with management of chains/franchises	Minors' ages: 14–16; minimum legal age was 18
Intervention stores were mailed an informational packet and a supply of warning signs containing that state's required wording prohibiting tobacco sales to persons under 18	Minors' ages: 14–16; 40% of intervention stores and none of control stores posted warning signs, but no effect on sales rate was observed
Educational program (6 months); "sting" operations, citations, media publicity (after 5 more months)	Minors' ages: 14–16; minimum legal age was 18; stores visited varied between preintervention and postintervention samples
Quarterly "stings," license suspension, fines of up to $500	Minors' ages: 12 and 13; all stores in local area visited before and after passage of local ordinance; proportion of local junior high school students reporting they were "regular smokers" decreased from 16% to 5%
None after initial educational campaign reported above (Altman et al. 1989)	Minors' ages: 14–16; minimum legal age was 18; study illustrates recidivism without continued enforcement
None, other than publicity surrounding new state law that increased penalties for sales to minors	Minors' ages: 12–15; minimum legal age was 18; all outlets visited multiple times by different minors; rates averaged
None, baseline study only	Minors' age: 11; minimum legal age was 18
None, baseline study only	Minors' ages: 10–13; no minimum legal age in effect
None, baseline study only	Minors' ages: 11–17; minimum legal age was 18
None, baseline study only	Minors' ages: 9–17; minimum legal age was 18
None, baseline study only	Minors' ages: 12 and 15
None, baseline study only	Minors' ages: 13–14; no law in effect, but new law making 18 the minimum age recently passed
None, baseline study only	Minors' ages 14–17; minimum legal age was 18

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Table 9. Published studies examining vending machine sales to minors, United States, 1989–1992

Study and location	Number of machines or attempts	Baseline sales rate (%)	Follow-up sales rate (%)	Relative reduction in purchases by minors (%)	Time period
Altman et al. (1989) California	30	100	100	NS*	6 months
Jason et al. (1991) Illinois	3–6	100	50 0	-50 -100	1 month 12 months
Feighery, Altman, Shaffer (1991) California	25	84	93 83	NS NS	6 months 11 months
Forster, Hourigan, McGovern (1992) Minnesota	79	82	80	NS	3 months
Forster, Hourigan, Kelder (1992) Minnesota	77	86	30 48	-65 -44	3 months 12 months
DiFranza et al. (1987) Massachusetts	6	86	NA†	NA	NA
Thomson and Toffler (1990) Oregon	10	100	NA	NA	NA
Hoppock and Houston (1990) Kansas	10	100	NA	NA	NA
Centers for Disease Control (1990) Colorado	24	100	NA	NA	NA

*NS = Not significant.
†NA = Not available.

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Enforcement methods	Comments
Community education, direct education of merchants, contact with management of chains/franchises	Minors' ages: 14–16; minimum legal age was 18
Letters to merchants, quarterly "stings," license suspension, fines up to $500	Minors' ages: 12 and 13; all machines in local area visited before and after passage of local ordinance
Educational program (6 months); "sting" operations, citations, media publicity (7–11 months)	Minors' ages: 14–16; minimum legal age was 18
None, other than publicity surrounding new state law that increased penalties for sales to minors	Minors' ages: 12–15; minimum legal age was 18; all outlets visited multiple times by different minors; rates averaged
None, other than new local ordinance requiring installation of locking devices on vending machines	Minors' age: 15; at 1 year, 30% of machines were still out of compliance with the locking device law; 91% of machines without and 39% of machines with locking devices sold to a minor at l-year follow-up
None, baseline study only	Minors' age: 11; minimum legal age was 18
None, baseline study only	Minors' ages: 11–17; minimum legal age was 18
None, baseline study only	Minors' ages: 12 and 15
None, baseline study only	Minors' ages: 9–17; minimum legal age was 18

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White Bear Lake, Minnesota, became the first city to abolish cigarette vending machines (Forster, Hourigan, Weigum 1990). Unfortunately, state legislation condoned by the tobacco industry in Iowa, Oregon, and Wisconsin includes a preemption prohibiting local governments from adopting more restrictive laws, thus ending community control over vending machine restrictions in these states.

The policies that cities and states have adopted to restrict cigarette vending machines, short of a total ban, include making simple requirements about placing the machines in view of an employee, restricting the machines to certain types of businesses or private facilities, requiring locking devices on the machines, or making policies that combine these regulations (Forster, Hourigan, Weigum 1990). Little is known about the effectiveness of these policies. A recent evaluation of a Saint Paul, Minnesota, ordinance that requires locking devices on all cigarette vending machines showed that purchase success was reduced from 86 percent before the law took effect to 19 percent three months later at locations where the locking devices were in place (Forster, Hourigan, Kelder 1992). However, 34 percent of the locations had not installed locking devices at three months; at one year, 30 percent still had not done so.

Laws that prohibit minors from purchasing or possessing tobacco—instead of laws that only prohibit merchants from selling tobacco to minors—have been adopted by a few states. The tobacco industry has actively supported these laws, which have been criticized by some health professionals as the industry's attempt to deflect responsibility for illegal sales from the merchants and the tobacco industry onto the children (DiFranza 1992b; Carol 1992). Laws prohibiting minors' possession of tobacco should be addressed only after effective regulation and enforcement at the retail level are in place.

Enforcement of Tobacco-Distribution Laws

Enforcement is important if laws that intend to restrict minors' access to tobacco are to be effective. A total ban on vending machine sales is clearly the easiest to enforce; more complicated, less restrictive laws require constant surveillance. In a 1990 study, the USDHHS, Office of Inspector General, found very few locations in the United States where state or local laws were being actively enforced (USDHHS 1992b). Results from preliminary cross-sectional studies in two communities that have evaluated compliance to tobacco-distribution laws suggest that the prevalence of tobacco use is reduced among youth in those communities (Jason et al. 1991; DiFranza, Carlson, Caisse 1992). However, more tightly controlled studies with biochemical confirmation of self-reported smoking status are needed to confirm this preliminary finding. A reduction in the availability of tobacco products to minors can reasonably be expected only if retailers are licensed and random unannounced inspections are conducted frequently. In some jurisdictions, licensing fees are used to hire health inspectors needed to ensure enforcement (DiFranza 1992b).

As discussed earlier in this chapter, Section 1926 of the ADAMHA Reorganization Act (Public Law 102-321), commonly called the Synar amendment, stipulates that to receive the full complement of block grant funding for treating and preventing substance abuse, states must enforce laws prohibiting the sale and distribution of tobacco products to persons under the age of 18. From fiscal year 1994 through fiscal year 1996, states must demonstrate success in reducing the availability of tobacco products to children under 18. These statutory provisions will provide significant new leverage for increased enforcement of laws to reduce sales of tobacco products to youth.

Voluntary Compliance with Age-at-Sale Laws for Tobacco

Numerous attempts have been made to encourage merchants to comply voluntarily (i.e., in the absence of enforcement) with laws prohibiting sales to minors (Altman et al. 1989; Skretny et al. 1990; Feighery, Altman, Shaffer 1991). The most effective of these approaches was a program that managed to reduce the rate of successful tobacco purchases by minors from 74 to 39 percent (Altman et al. 1989), although about half of this improvement had disappeared within a year (Altman et al. 1991). The program had no effect on illegal sales from vending machines; 100 percent of these attempts were successful.

Recently, representatives of 91 regional and corporate headquarters of U.S. tobacco companies were interviewed about their beliefs, attitudes, knowledge, and practices regarding young people's access to tobacco (Altman et al. 1992). These individuals expressed at least moderate support for policies limiting teenage access to tobacco. Respondents' estimates of the frequency of sales to minors were far below the rates reported in studies that arranged for youth to try making tobacco purchases. Spokespersons from most companies reported having policies in place to prevent tobacco sales to minors; however, only about half of these representatives could state the legal age of tobacco sale in the state in which they lived.

At least one corporation, SuperAmerica, has demonstrated that internal programs to reduce cigarette sales to minors can be effective if accompanied by consistent surveillance. In response to an increase in the penalty for the sale of cigarettes to minors in Minnesota and to

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convince all employees that the company did not want an illegal sale, SuperAmerica initiated a comprehensive companywide effort among its 670 stores across the nation to eliminate tobacco sales to minors (Hardman 1992). The company developed training materials, including a training video, that address key aspects of tobacco and alcohol sales. These materials cover product definitions, legal age for purchase, instructions on when and how to ask for identification, acceptable forms of identification, detection of false identification, instructions on when and how to refuse a sale, and the consequences of making an illegal sale. All employees—from managers to sales clerks—view the videotape, take a quiz on the contents, and sign a statement that they will adhere to company policies and procedures as a condition of employment. Printed guidelines, such as a booklet that shows samples of driver's licenses from all 50 states, are distributed to employees. In at least one division, area managers and company auditors have conducted up to three surveillance operations per month. Through ongoing educational efforts, rewards for compliant employees, and warnings or possible dismissal for repeatedly noncompliant employees, the company reports achieving approximately 90 percent compliance in their operations. Though the program has not been independently evaluated, it appears to be successful, has drawn significant public attention, and is attracting the interest of other businesses.

The It's the Law program, introduced by the Tobacco Institute in December 1990, is an educational campaign intended to discourage those who are underage from purchasing tobacco products and to help curb youth access to cigarettes through aggressive work with the retail community and by supporting new state laws (Tobacco Institute 1990a). The program consists of window decals, buttons, and a packet of educational materials for merchants. In a February 1992 letter to state governors, the Tobacco Institute stated that "over one million pieces of program materials have been distributed to thousands of retail outlets across the country" (Chilcote 1992, p. 2). The materials closely resemble those distributed by health officials and tobacco-control professionals in many communities. One version of the materials displayed a hand holding a lit cigarette with the text, "It's the law / You must be 18 (19) to buy tobacco products." This text, however, seems to suggest that it is illegal for minors to purchase tobacco, whereas in most states it is only illegal for merchants to sell tobacco to minors (Choi, Novotny, Thimis 1992). This inaccuracy is not a minor point; parents misinterpreting these decals may be reluctant to report a merchant who has sold tobacco to their child if they mistakenly believe their child has violated the law (SmokeFree Pennsylvania 1991).

During the summer of 1991, an experiment was conducted to determine the efficacy of the It's the Law program (DiFranza and Brown 1992). Teenagers 13 through 16 years old attempted purchases of tobacco from 156 retailers in Massachusetts. Only seven of the retailers were participating in the It's the Law program. Six of the seven participating retailers (86 percent) proved willing to illegally sell tobacco to the teenagers; 131 of 149 (88 percent) nonparticipating retailers proved willing to make such sales.

Model Laws to Restrict Distribution of Tobacco to Minors

Former Secretary of Health and Human Services Louis W. Sullivan, M.D., proposed to all states a Model Sale of Tobacco Products to Minors Control Act that contains the following provisions (PHS 1990):

- *Institute 19 years as the minimum age for legal tobacco sales.* One rationale for a minimum age of 19 is that many high school seniors are 18 years of age. Setting the minimum age at 19 would help keep tobacco out of high schools. Further raising the age to 21 would provide a parallel with alcohol laws and would facilitate the enforcement of both laws, since one system could be set up to enforce both laws.

- *Create a tobacco-sales licensing system* similar to that used for alcoholic beverages. Without a licensing system, health and law enforcement officials have no control over who sells tobacco. A licensing system provides enforcement officials with a list of retailers, thus facilitating educational and enforcement activities. Applicants for tobacco licenses could be required to pass a written examination (analogous to those required for a driver's license) to ensure that these vendors understand their legal responsibilities.

- *Establish a graduated schedule of penalties for illegal sales.* These penalties should include suspension or revocation of a retailer's license to sell tobacco because of repeated violations of the age-at-sale law.

- *Place primary responsibility for enforcement with a designated state agency;* local law enforcement and public health officials should also participate and have input. A comprehensive enforcement program can be funded, without increasing the tax burden, through the sale of tobacco retail licenses (Davis 1991; DiFranza 1992b). An additional source of revenue is the state excise tax on tobacco, especially that portion derived from illegal sales to minors. Several authors have called for an "illegal profits tax" to be levied on the profit that tobacco companies realize from the illegal sale of their products to minors (Slade 1988; DiFranza and Tye

1990; Cummings, Pechacek, Sciandra 1992; Glantz 1993).

- *Use civil penalties and local courts to assess fines.* Attempts to enforce access laws through criminal proceedings have proved troublesome. Police officials are reluctant to prosecute because it is time consuming and costly (USDHHS 1992b). Judges are reluctant to burden offenders with a criminal record for selling tobacco to minors and are more apt to suspend sentences or issue warnings with no fines (Feighery, Altman, Shaffer 1991). Civil enforcement allows violations to be handled through a ticketing or administrative mechanism and avoids the need for court hearings (Jason et al. 1991). Local health departments could provide such enforcement, similar to their role in performing restaurant inspections (Davis 1991).
- *Ban cigarette vending machines.* As discussed above, less restrictive measures against vending machine sales have been shown to be less effective than stronger measures in preventing tobacco sales to minors.

Additional features recommended for model laws include requiring that retailers post highly prominent signs detailing that the law (for example) requires that tobacco be sold from behind the checkout counter, bans the sale of individual cigarettes and the distribution of free samples of tobacco products, and bans the distribution of tobacco through the mail (DiFranza 1992a).

A recent study (Choi, Novotny, Thimis 1992) analyzed the adequacy of state laws restricting minors' access to tobacco (Table 10). The study found that no states are meeting all the criteria set by the former Secretary of Health and Human Services. Only New Hampshire, Massachusetts, New Jersey, and Utah meet even moderate standards, and the majority of states have only basic protection against providing tobacco to minors.

As was discussed earlier in this chapter, as part of the ADAMHA Reorganization Act (Public Law 102-321), the sale and distribution of tobacco products to anyone under the age of 18 is to be banned in all states by October 1, 1993. A recent report that updates the data of Choi, Novotny, and Thimis (1992) examines the extent to which states have adopted and enforced youth access laws (USDHHS 1992b). All 50 states and the District of Columbia now ban the sale of tobacco to persons under the age of 18. Only Florida and Vermont, however, are

Table 10. Types of laws used by states to restrict minors' access to tobacco

Category	Number of states	Regulations
None	4	No restrictions on the sale of cigarettes or other tobacco products to minors
Nominal	5	Law banning the sale of tobacco to minors below a minimum age
Basic	38*	Law banning the sale of tobacco to minors aged < 18 years Penalties (fines) for the sale or distribution of tobacco products to minors
Moderate	4	Basic regulations, plus the following: Signs at points-of-sale warning about the illegality of the sale of tobacco products to minors; requirement of a state-issued retail tobacco license
Comprehensive	0	Moderate regulations, plus the following: Ban on all distribution of tobacco samples and coupons for free samples; commitment of resources for enforcement through license fees; no preemption clause prohibiting local communities from passing more restrictive minors' access laws; exemption for "sting" operations conducted at the local level

Source: Choi, Novotny, Thimis (1992).
*Includes the District of Columbia.

enforcing their laws through their liquor control agencies (USDHHS 1992b). Low priority by police and the lack of a designated enforcer were seen as obstacles to enforcing youth access laws.

Warning Labels on Tobacco Products

Introduction

For this report, the term "labeling" refers to the provision of health-related information on packages and in advertising. Package warning labels can include either brief statements printed directly on tobacco packages or more detailed information placed on package inserts, similar to the requirements for pharmaceutical products.

History of Warning Labels on Tobacco Products

Shortly after the Surgeon General released the 1964 report of the Advisory Committee on Smoking and Health (PHS 1964), the Federal Trade Commission (FTC) proposed three administrative rules that would have required health warnings on cigarette packages and advertisements and imposed certain restrictions on cigarette advertising (FTC 1964a). In part, the FTC proposed that every cigarette advertisement and every pack, box, carton, and other container in which cigarettes were sold to the public carry one of the following warnings:

> CAUTION—CIGARETTE SMOKING IS A HEALTH HAZARD: The Surgeon General's Advisory Committee on Smoking and Health has found that cigarette smoking contributes substantially to mortality from certain specific diseases and to the overall death rate.
>
> CAUTION: Cigarette smoking is dangerous to health. It may cause death from cancer and other diseases.

In preparing its final ruling, published in June 1964 after a six-month comment period, the FTC found that cigarette advertisements were false and deceptive because they failed to disclose known health hazards (FTC 1964b). The ruling therefore required all cigarette advertising and every container in which cigarettes were sold to consumers to disclose prominently that cigarette smoking is dangerous and may cause death from cancer and other diseases. However, the final rule left the specific wording of the warning to the discretion of the tobacco manufacturers.

The Federal Cigarette Labeling and Advertising Act of 1965 (Public Law 89-92) preempted the FTC regulation before its scheduled enactment date. This legislation, the first federal statute to enact labeling requirements for tobacco products, marks one of the earliest efforts of the federal government to warn the public about the health risks of smoking (see Table 11). However, the provisions of the Cigarette Labeling and Advertising Act were generally less stringent than the FTC regulations they replaced. For example, the act required that all cigarette packages contain the following health warning:

> CAUTION: Cigarette Smoking May Be Hazardous to Your Health.

This statutory warning was weaker than the earlier proposed FTC warning in that it did not specifically mention the risk of death from cancer and other diseases. Further, whereas the FTC would have required warning disclosures on product advertisements, the Federal Cigarette Labeling and Advertising Act temporarily (through June 1969) prohibited any governmental body (including federal regulatory agencies, such as the FTC) or individual state from requiring a health warning in cigarette advertising. The Federal Cigarette Labeling and Advertising Act also prohibited any health warning on cigarette packages other than the statement required by the act itself.

On the other hand, the act required the FTC to transmit an annual report to Congress describing the effectiveness of cigarette labeling, discussing current cigarette advertising and promotional practices, and making recommendations for legislation. In its first report to Congress (FTC 1967), the FTC recommended extending the health warning to cigarette advertisements and strengthening the wording:

> WARNING: Cigarette Smoking Is Hazardous to Health and May Cause Death from Cancer and Other Diseases.

In mid-1969, just before the expiration of the congressionally imposed temporary restrictions on its actions, the FTC proposed a rule that would have required all cigarette advertising "to disclose, clearly and prominently—that cigarette smoking is dangerous to health and may cause death from cancer, coronary heart disease, chronic bronchitis, pulmonary emphysema, and other diseases" (FTC 1969a).

The subsequent Public Health Cigarette Smoking Act of 1969 (Public Law 91-222) banned cigarette advertising on television and radio after January 1, 1971, and strengthened the package warning label (effective November 1970) to read as follows:

> WARNING: The Surgeon General Has Determined That Cigarette Smoking Is Hazardous to Your Health.

Nonetheless, the labeling provisions of this law, like the Federal Cigarette Labeling and Advertising Act before it, were substantially less stringent than the FTC regulations they preempted. Furthermore, the statutory language of the act continued to omit specific references to the risks and

Table 11. Major legislation related to information and education about tobacco and health in the United States, 1965–1986

Law	Date	Labeling requirements
Federal Cigarette Labeling and Advertising Act (Public Law 89-92)	1965	Required a health warning on cigarette packages Preempted other warnings on packages Temporarily preempted Federal Trade Commission (FTC) requirements of any health warning on cigarette advertisements
Public Health Cigarette Smoking Act (Public Law 91-222)	1969	Strengthened the health warning on cigarette packages Preempted other warnings on packages Temporarily preempted FTC requirement of any health warning on cigarette advertisements*
Little Cigar Act (Public Law 93-109)	1973	None
Comprehensive Smoking Education Act (Public Law 98-474)	1984	Replaced the previous health warning on cigarette packages and advertisements* with a system requiring rotation of four specific health warnings Preempted other warnings on packages
Comprehensive Smokeless Tobacco Health Education Act (Public Law 99-252)	1986	Required the rotation of three health warnings on smokeless tobacco packages and advertisements (in circle-and-arrow format on advertisements) Preempted any other health warning on smokeless tobacco packages or advertisements (except billboards)

Source: U.S. Department of Health and Human Services (1989).

*In 1972, an FTC consent order extended the requirement for a health warning on cigarette packages to include cigarette advertisements.

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Advertising requirements	Congressional reporting requirements	Other stipulations
	Annual report to Congress on health consequences of smoking (U.S. Department of Health, Education, and Welfare [USDHEW]) Annual report to Congress on cigarette labeling and advertising (FTC)	None
Prohibited cigarette advertising on television and radio; preempted any state or local requirement or prohibition based on smoking and health with respect to cigarette advertising or promotion	Annual report to Congress on health consequences of smoking (USDHEW) Annual report to Congress on cigarette labeling and advertising (FTC)	None
Extended broadcast ban on cigarette advertising to "little cigars"		None
None	Biennial status report to Congress on smoking and health (U.S. Department of Health and Human Services [USDHHS])	Created the Federal Interagency Committee on Smoking and Health (USDHHS) Cigarette industry must provide a confidential list of cigarette additives[†] (USDHHS)
Prohibited smokeless tobacco advertising on television and radio	Biennial status report to Congress on smokeless tobacco use (USDHHS) Biennial report to Congress on smokeless tobacco sales, advertising, and marketing practices (FTC)	Required public information campaign on health hazards of using smokeless tobacco[‡] (USDHHS) Smokeless tobacco companies must provide a confidential list of additives and a specification of nicotine content in smokeless tobacco products[†] (USDHHS)

[†] List of additives does not identify company or cigarette brand, no public disclosure of additives on packages or advertisements required, and no other public disclosure allowed.

[‡] No funds have been appropriated to carry out this campaign.

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consequences of smoking and extended the preemption on requiring any additional health warning for cigarette packages. The FTC was again temporarily restricted (through June 1971) from issuing regulations that would require a health warning in cigarette advertising.

After the second congressional moratorium expired in late 1971, the FTC announced its intention to file complaints against cigarette companies for failure to warn in their advertising that smoking is dangerous to health. Negotiations among the companies and the FTC resulted on March 30, 1972, in consent orders requiring that all cigarette advertising "clearly and conspicuously" display the same warning required by Congress for cigarette packages (FTC 1981). That consent order specified the type size of the warning in newspaper, magazine, and other periodical advertisements of various dimensions; for billboard advertisements, the size of the lettering was specified in inches (FTC 1972).

In 1975, the U.S. government filed a complaint in the U.S. District Court for the District of Columbia against the cigarette companies for alleged violation of the consent order, including failure to display the health warning in some advertising, failure to display lettering of the specified size in billboard warnings, and failure to properly place the warning in some advertisements (FTC 1982). This action led to judgments in 1981 against the six major cigarette companies (U.S.A. v. Liggett et al. 1981; U.S.A. v. R.J. Reynolds 1981), in which the tobacco manufacturers were required to use larger lettering in the warnings displayed in billboard advertising. In 1981, the FTC also sent a staff report to Congress that concluded that the warning appearing on cigarette packages and in advertisements had become overexposed and "worn out" and was thus no longer effective (FTC 1981). The report pointed out that the existing warning was too abstract, generally difficult to remember, and not personally relevant. Further noting that a singular warning did not communicate sufficient information on the significant, specific risks of smoking, the report recommended changing the shape of the warning to a circle-and-arrow design (as is currently used in advertisements for smokeless tobacco products [see Figure 5]), increasing the size of the warning, and replacing the existing single warning with a rotational system of warnings.

Current Status of Warning Labels

The 1981 FTC staff report would eventually help prompt passage of the Comprehensive Smoking Education Act (Public Law 98-474), which became effective on October 12, 1984. Effective one year after being signed, this law required cigarette companies to rotate the following four warnings on all cigarette packages and in all cigarette advertisements:

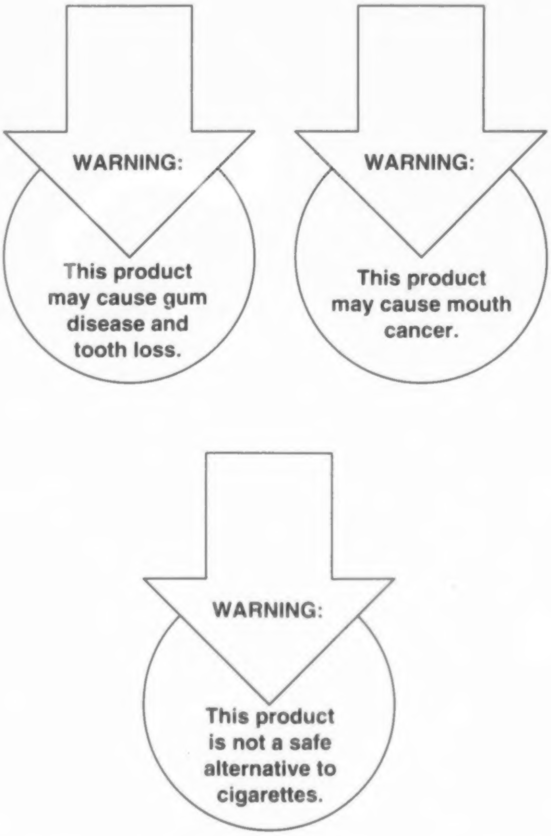
SURGEON GENERAL'S WARNING: Smoking Causes Lung Cancer, Heart Disease, Emphysema, and May Complicate Pregnancy.

SURGEON GENERAL'S WARNING: Quitting Smoking Now Greatly Reduces Serious Risks to Your Health.

SURGEON GENERAL'S WARNING: Smoking by Pregnant Women May Result in Fetal Injury, Premature Birth and Low Birth Weight.

SURGEON GENERAL'S WARNING: Cigarette Smoke Contains Carbon Monoxide.

Figure 5. Health warnings required for smokeless tobacco advertisements (except billboards)


WARNING:
This product may cause gum disease and tooth loss.
WARNING:
This product may cause mouth cancer.
WARNING:
This product is not a safe alternative to cigarettes.

Sources: U.S. Department of Health and Human Services (1989); Federal Trade Commission (1981).

These rotational warnings retained, however, the rectangular visual format that the FTC staff had recommended abandoning. The congressional warnings were also substantively more passive in their wording than those suggested by the FTC. For example, the FTC had proposed the following two warnings to caution consumers on the risks of smoking during pregnancy:

> Smoking increases the risk of death of your unborn child.
>
> Smoking increases the risk of spontaneous abortion and stillbirth.

In 1986, Congress extended requirements for warning labels to smokeless tobacco products by passing the Comprehensive Smokeless Tobacco Health Education Act (Public Law 99-252). This act requires tobacco manufacturers to display and regularly rotate the following three warnings on all smokeless tobacco packages and on all smokeless tobacco advertising (except billboards):

> WARNING: This product may cause mouth cancer.
>
> WARNING: This product may cause gum disease and tooth loss.
>
> WARNING: This product is not a safe alternative to cigarettes.

The act stipulates that the warnings displayed in advertisements appear in the circle-and-arrow format (see Figure 5) that the FTC recommended in 1981 for cigarettes (FTC 1981). The act prohibits federal agencies as well as state or local jurisdictions from requiring any other health warnings on smokeless tobacco packages and advertisements. However, states are not preempted from enacting additional advertising restrictions.

Limitations of Warning Labels

An unintended consequence of the federally mandated warning disclosure concerns product liability (U.S. Congress 1989; Gostin, Brandt, Cleary 1991). Surgeon General Luther Terry enjoyed widespread support from the general public and the health community when he endorsed package warning labels during congressional testimony. Dr. Terry commented that "the public is awaiting these steps. Such warnings could materially increase public awareness of the health hazard by providing concrete evidence of governmental concern" (U.S. Congress 1965, p. 33). Yet no one publicly anticipated that the display of a federally mandated warning would eventually shield tobacco manufacturers from product liability. Ironically, the tobacco industry has thus far been insulated from lawsuits by legislation it has resisted steadfastly since 1965 (U.S. Congress 1965, 1983, 1989). In 1989, Congress considered a bill (H.R. 4543) that addressed this unintended protection, but the bill has not been approved.

Although tobacco manufacturers are legally obligated to disclose health warnings on their product packaging and advertising, and although Congress has enacted legislation that has increased the size, number, and specificity of the warnings, these legal requirements have not been as restrictive as the FTC has recommended. Moreover, requirements for warning disclosures on promotional items (e.g., T-shirts, caps, key chains, lighters) and sponsorship logos (such as the Virginia Slims tennis tournament or the Winston Cup National Association for Stock Car Auto Racing [NASCAR] races) are noticeably absent from current legislation. Only the printed materials (such as catalogues and wrapping accompanying promotional items) are required to carry warning labels. Thus, despite the statutory ban on broadcast advertising, widespread corporate sponsorship of televised events enables even very young viewers to see cigarette brand names displayed with no health warning (Aitken, Leathar, Squair 1986; Blum 1991). The tobacco industry spent nearly $100 million on sports and sporting events in 1990, a more than 10 percent increase over the previous year (FTC 1992). Spending on public entertainment and promotional items has also increased dramatically. In contrast, spending on magazine advertisements, which do carry warning disclosures, decreased by more than $52 million (14 percent) from 1989 to 1990.

Federal law regarding health warnings for tobacco products continues to preempt state actions, even on advertisements displayed solely within their jurisdiction (such as event sponsorship and billboard, mass transit, and point-of-sale advertising). The tobacco industry favors the preemption, arguing that to permit local action would "invite censorship" in violation of the First Amendment and would abandon "Congress' consistent 25-year policy of nationally uniform regulation" (U.S. Congress 1990, p. 80).

Effectiveness of Warning Labels

Warning labels have a well-established history of use with products associated with medical risks or dangerous potential consequences for users. Labeling information intended to inform consumers of relative risk and benefit is also provided on many consumer goods (for example, nutrition labeling on packaged foods and energy-consumption information on energy appliances). Research on consumer response to such labeling information has yielded mixed results (Beltramini 1988), yet two basic factors appear to influence the usefulness of such labels (USDHHS 1987b; Centre for Behavioural

Research in Cancer 1992). First, to have an impact on consumers, warning labels must be designed to take into account those factors that might influence consumer response (e.g., a consumer's previous experience with the product, previous knowledge of the risks associated with the product's use, and level of education or literacy). Second, the labels should be designed in an attention-demanding format, and the information they bear should be specific rather than general and written in clear, nontechnical language.

As was noted before, the Federal Cigarette Labeling Act of 1965 (Public Law 89-92) mandated cigarette warning labels so that "the public may be adequately informed that cigarette smoking may be hazardous to health." However, more specific communications objectives were not defined by any of the subsequent legislation. Information provision is clearly distinct from information impact (Jacoby, Chestnut, Silberman 1977). Research indicates that merely placing a warning on a label or an advertisement is not sufficient for information processing (Beltramini 1988). One can generally infer that the goal of warning labels for cigarettes has been to increase public knowledge about the hazards of smoking, but without more specific goals it is difficult to evaluate whether the labels have had an impact on consumer decision-making or behavior. Moreover, it is unclear which "public" Congress intended to be "adequately informed." Is the public that segment of the general populace who currently smoke, that segment who could potentially begin to smoke (principally young people), or that portion of the public (principally adults) who have decided to try to quit smoking? Clearly, a warning can communicate effectively to one segment of the public without having an impact on the others.

Without clear objectives or operational definitions, no ready standards are available to evaluate the effects of warning labels; and although warning labels have been required since 1966, little had been reported about their effectiveness in meeting any objective (USDHHS 1987b). Currently, there are no controlled studies that permit definitive assessment of the independent impact of cigarette warning labels on knowledge, beliefs, attitudes, or smoking behavior. The few available empirical studies deal with the visibility of cigarette warnings in advertising and consistently indicate that the Surgeon General's warnings are given little attention or consideration by viewers. Research on package warning labels is even scarcer.

In a 1978 Starch Message Report survey, only 2 percent of adults exposed to cigarette ads in 24 different magazines read the Surgeon General's warning in those ads (FTC 1981). Similarly, a 1978 study for the Brown and Williamson Tobacco Company found that only 2 percent of the respondents read the entire warning in seven ads for Kool cigarettes; the average time spent "examining" the warning was less than a second. In an advertising copy test conducted for the Liggett & Meyers Tobacco Company in 1976, no respondents read the entire warning (FTC 1981).

More recent studies suggest that little attention is paid to the post-1985 rotational warnings. To examine adolescent viewing of tobacco advertisements, Fischer et al. (1989) adapted the market research methodology of eye-tracking. A computer recorded eye movement as subjects viewed five different tobacco advertisements with no time constraints. The average viewing time of the warnings totaled only 8 percent of the total advertisement viewing time. These data further indicate that more than 40 percent of subjects did not even view the warning. An additional 20 percent looked at the warning but failed to actually read it. Given such strong evidence of negligible viewing and processing of warning labels, Fischer et al. (1989) concluded that existing warnings are unlikely to effectively counter the images of independence, romance, and fun inherent in tobacco advertising.

Evidence from other studies suggests that imagery draws attention away from the text of the warnings (Richards and Zakia 1981; Zerner 1986). The FTC suggested that cigarette companies were explicitly designing advertising to "divert or distract attention away from the health consequences of smoking" (FTC 1981, p. 2-2). Intentionally or not, the sheer volume of cigarette advertising, all of which attempts to incorporate the basic themes of product satisfaction, positive image associations, and risk minimization (Popper 1986), may overwhelm the health-promoting effect of warnings in advertisements (Schwartz 1986).

Research indicates that novel warning formats are more likely to capture viewer attention (Cohen and Srull 1980). The potential communications effectiveness of the more pointed post-1984 warnings may have been diminished with the retention of the original rectangular shape of the pre-1985 warnings (Bhalla and Lastovicka 1984). Similarly, although the shape of the warnings in smokeless tobacco advertisements may have been novel initially, the size and color of these warnings may now have a reduced effect (Popper and Murray 1989).

Some studies suggest that warning labels may not be readable in some advertising media. Davis and Kendrick (1989) found that under typical driving conditions, the average motorist could read an entire warning in about one-half of billboard advertisements on streets and in only 5 percent of billboard advertisements on highways. Stationary observers could not read the warnings in any of the transit advertisements studied. All warnings in the study were in compliance with the congressionally mandated FTC warning-size templates.

By contrast, subjects could almost always read the brand names and identify the advertisement's notable imagery.

Despite the negligible attention and poor readability reported across these studies, there is some evidence that consumers have moderate awareness of the current four warning messages. Using a warning recognition test (rather than a test of the prominence or strength of the message) to assess basic awareness and attention, Lieberman Research (unpublished data) found that one-half of smokers (but fewer than one-half of nonsmokers) were able to correctly recall one of the rotational warnings. Nearly all recalled the single pre-1985 warning. However, Fischer et al. (1989) obtained different results in their masked recall test with adolescents. After adolescents viewed a series of ads, the researchers covered up the advertisement headings, all specific references to cigarette brand names, and the Surgeon General's warning. Three-fourths of participants could identify the masked warning as a health message, but only 19 percent could recall even the general theme of the warning. These data may suggest that adolescents are generally aware of the presence of warning labels in tobacco ads but are far less informed than adults are of the specific health messages. Similarly low levels of warning recall among young adults were found for the smokeless tobacco warnings (Popper and Murray 1989).

Research in communication effectiveness (Day 1973) suggests that when viewers actually attend and read them, warnings do more than merely provide information. Warnings can also produce potentially affective and behavioral impacts (Beltramini 1988). Analyses of the wording and format of mandated health warnings have suggested reasons for the limited affective and behavioral impact that can occur even under optimal conditions of attention and processing. For example, use of any conditional words such as *can* and *may* can dramatically reduce the effect of the entire warning (Linthwaite 1985). Since two of the current rotational warnings include the word *may* (see Table 12), consumers may minimize the inherent health warnings of these messages (Dumas 1992). Furthermore, although the information presented in the current warnings is more detailed and more absolute than the pre-1985 single warning, it is also presented in a more impersonal manner. Readers may be more likely to believe, learn from, and act on warnings that are personally relevant than on warnings that are abstract and technical (Fishbein 1977).

Analysis of the general public's knowledge of the health risks of smoking could provide some evidence of the impact of warnings. Although such knowledge has clearly increased since 1966, when the first health warning label was required, the effect of the warnings cannot be isolated from a number of other information sources, such as reports of the Surgeon General or reported research in the news (FTC 1974; Murphy 1980; USDHHS 1987a). Similarly, it is impossible to determine any independent effects of health warnings on aggregate cigarette sales (FTC 1967, 1969b) or to isolate the independent effects of advertising on those aggregate sales. Indeed, the two effects counter one another and therefore confound research. However, a recent and extensive discussion of the issues in the Australian publication *Health Warnings and Contents Labelling on Tobacco Products* reports formative data on providing more noticeable and informative labels to consumers and assembles a compendium of warnings worldwide (Centre for Behavioural Research in Cancer 1992).

Perhaps the most powerful indirect indicator of the effect of cigarette warnings is the number of smokers and consumers who remain unaware of the health risks of smoking. After a comprehensive review of studies on health-risk awareness, including publicly generated studies and those conducted by the tobacco industry, the FTC concluded that significant numbers of consumers and still higher numbers of smokers were unaware of even the most rudimentary risk information about smoking (FTC 1981). It was this lack of consumer awareness that led the FTC in 1981 to call for a larger and more attention-demanding format and for expanded (16 different) rotational warnings for cigarettes.

Effect of Tobacco Taxation

Introduction

Tobacco is taxed in a variety of ways by federal, state, and local government. The most important of these taxes are the federal and state excise taxes on cigarettes and the general state sales tax applied to tobacco products in most states. Historically, these taxes have been seen as an effective way to generate revenues, as with taxes on alcohol. However, in recent years, increased taxation of tobacco products has been supported as a public health measure aimed at discouraging smoking and other tobacco use.

History of Tobacco Taxation

Federal Tobacco Taxes

During the late eighteenth and early nineteenth centuries, the federal government experimented with excise taxes on tobacco products. However, because of opposition from both producers and consumers, the taxes imposed in 1794, 1812, 1816, and during the Civil War were repealed and finally reduced to one cent per pack. During the first half of the twentieth century, federal taxes were, as before the Civil War, increased to help

Table 12. Health warnings required on tobacco packages and advertisements in the United States, 1966–1993

Health warnings	Effective dates	Packages	Advertisements
Cigarettes			
CAUTION: Cigarette Smoking May Be Hazardous to Your Health.	January 1, 1966–October 31, 1970	X	
WARNING: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.	November 1, 1970–October 11, 1985	X	
	March 30, 1972–October 11, 1985		X[*]
SURGEON GENERAL'S WARNING: Smoking Causes Lung Cancer, Heart Disease, Emphysema, and May Complicate Pregnancy.	October 12, 1985–present	X	X[†]
SURGEON GENERAL'S WARNING: Quitting Smoking Now Greatly Reduces Serious Risks to Your Health.	October 12, 1985–present	X	X[†]
SURGEON GENERAL'S WARNING: Smoking by Pregnant Women May Result in Fetal Injury, Premature Birth and Low Birth Weight.	October 12, 1985–present	X	X[†]
SURGEON GENERAL'S WARNING: Cigarette Smoke Contains Carbon Monoxide.	October 12, 1985–present	X	X[†]
Smokeless tobacco			
WARNING: This product may cause mouth cancer.	February 27, 1987–present	X	X[‡]
WARNING: This product may cause gum disease and tooth loss.	February 27, 1987–present	X	X[‡]
WARNING: This product is not a safe alternative to cigarettes.	February 27, 1987–present	X	X[‡]

Source: Federal Trade Commission (1981).

[*] Required by Federal Trade Commission consent order. All other warnings required by federal legislation.

[†] The four warnings mandated for cigarette advertisements on outdoor billboards are slightly shorter versions of the same messages.

[‡] The warnings on advertisements must appear in a circle-and-arrow format (see Figure 5). No warnings are required on outdoor billboards.

finance U.S. military involvement. The last of a series of increases took place on November 1, 1951, during the Korean War, when the tax was increased from seven to eight cents per pack. The tax remained at that level for the next 30 years.

Over the past decade, however, the federal tax on cigarettes has been increased significantly. These recent increases were motivated by a different goal—the need to raise revenues to deal with the increasing federal budget deficit. The first of these deficit-motivated increases occurred on March 1, 1983, as part of the Tax Equity and Fiscal Responsibility Act of 1982, when the tax was doubled to 16 cents per pack. This increase was intended as a temporary measure that would be repealed by October 1, 1985. However, after being extended several times, the doubling of the tax was made permanent in 1986.

As part of the Omnibus Budget Reconciliation Act of 1985, a tax of 24 cents per pound was levied on snuff, a tax of 8 cents per pound was imposed on chewing tobacco, and a tax of 45 cents per pound was applied to pipe tobacco. The Omnibus Budget Reconciliation Act of 1990 further increased federal taxes on cigarettes from 16 cents to 20 cents per pack on January 1, 1991; a scheduled additional increase of 4 cents per pack was levied on January 1, 1993. As of 1993, federal taxes on other tobacco products are 36 cents per pound for snuff, 12 cents for chewing tobacco, and 67.5 cents for pipe tobacco. This represents a tax of less than 3 cents per can of snuff or pouch of chew; the tax on a pack of cigarettes is 24 cents. Yet even though federal taxes on tobacco have increased recently, they have become a less important source of revenue for the federal government. In 1950, tobacco excise taxes accounted for 3.36 percent of all federal revenues; by 1989, they accounted for only 0.44 percent of revenues (Congressional Budget Office [CBO] 1990).

State and Local Tobacco Taxes

In 1921, Iowa became the first state to impose an excise tax on cigarettes, followed in 1923 by Georgia, South Carolina, South Dakota, and Utah. By the end of the 1920s, six additional states had enacted a cigarette excise tax. By 1940, more than half of all states levied taxes on cigarettes, and by 1950, only a handful of states were not imposing an excise tax. In 1969, North Carolina became the last state to enact an excise tax on cigarettes. As with the federal government, the imposition of, and increases in, state cigarette taxes have partly represented attempts to raise revenue rather than to lower smoking prevalence. Warner (1981) argues that this financial motive is especially clear in the history of excise taxes on cigarettes in the six major tobacco-producing states. The average date when these states instituted a cigarette excise tax was 1939—one year earlier than the average for the remaining states, and many years before the widespread publicity on the health hazards of smoking. Just before the negative publicity, the average tax rate for these six states was 2.5 cents per pack, a figure only slightly less than the other states' average of 2.9 cents per pack. As is discussed later, the difference has increased greatly since then.

Some evidence suggests that state governments have recently used cigarette excise taxes as a major part of antismoking campaigns. This conclusion can be drawn from reviewing the number of increases in state excise tax rates after the mid-1950s release of the first scientific studies that linked smoking to poor health, and particularly after the 1964 release of the initial Surgeon General's report on smoking and health (PHS 1964). For instance, during the latter half of the 1950s, more than eight tax increases occurred per year among the states, whereas fewer than three per year occurred each year in the early 1950s. Similarly, in the year after the 1964 Surgeon General's report, there were a record 22 increases in state excise taxes on cigarettes.

The established pattern of tax increases continued during the period when the Fairness Doctrine permitted antismoking messages on television and radio, and again after the 1971 ban on television and radio advertising (Warner 1981). Moreover, as Warner (1981) notes, the once negligible difference between the tax rates in the tobacco-producing states and in the remaining states widened significantly over this period. This difference has continued to widen since 1981. By January 1, 1992, the average tax rate in the tobacco-producing states was 7 cents per pack, whereas the average tax rate in the remaining 44 states and Washington, D.C., was 26 cents per pack.

The active use of cigarette and other tobacco taxes to discourage tobacco use in some states and the relative inaction in others results in large differences in taxes and, consequently, in cigarette prices among states. For example, the cigarette excise tax ranges from less than 3 cents per pack in Virginia to 60 cents per pack in Hawaii (see Table 13). When local taxes are added, the differences become even larger in some locations. The differences in taxes and prices create incentives for the casual smuggling (i.e., involving relatively small quantities, generally for personal use) and organized smuggling (i.e., involving large quantities, generally for resale) of cigarettes from low-tax localities to high-tax localities and create incentives for other tax-evasion activities.

The relative ease of transporting cigarettes across localities has encouraged some people to profit from this activity (Advisory Commission on Intergovernmental Relations [ACIR] 1977, 1985). Although casual smuggling

Table 13. State* cigarette taxes, July 1, 1993

State	Excise tax rate (cents per 20-cigarette pack)	Sales tax† (cents per pack)	Total state tax (cents per pack)
Alabama	16.5	7	23.5
Alaska	29.0	0	29.0
Arizona	18.0	9	27.0
Arkansas	31.5	9	40.5
California	35.0	15	50.0
Colorado	20.0	0	20.0
Connecticut	47.0	12	59.0
Delaware	24.0	0	24.0
District of Columbia	65.0	13	78.0
Florida	33.9	12	45.9
Georgia	12.0	6	18.0
Hawaii	60.0	9	69.0
Idaho	18.0	9	27.0
Illinois	30.0	13	43.0
Indiana	15.5	9	24.5
Iowa	36.0	11	47.0
Kansas	24.0	9	33.0
Kentucky	3.0	9	12.0
Louisiana	20.0	8	28.0
Maine	37.0	11	48.0
Maryland	36.0	10	46.0
Massachusetts	51.0	9	60.0
Michigan	25.0	7	32.0
Minnesota	48.0	14	62.0
Mississippi	18.0	11	29.0
Missouri	13.0	7	20.0
Montana	19.3	0	19.3
Nebraska	34.0	9	43.0
Nevada	35.0	13	48.0
New Hampshire	25.0	0	25.0
New Jersey	40.0	12	52.0
New Mexico	21.0	9	30.0
New York	56.0	8	64.0
North Carolina	5.0	6	11.0
North Dakota	44.0	11	55.0
Ohio	24.0	8	32.0
Oklahoma	23.0	8	31.0
Oregon	28.0	0	28.0
Pennsylvania	31.0	11	42.0
Rhode Island	37.0	14	51.0
South Carolina	7.0	8	15.0
South Dakota	23.0	7	30.0
Tennessee	13.0	14	27.0
Texas	41.0	13	54.0
Utah	26.5	9	35.5
Vermont	20.0	9	29.0
Virginia	2.5	7	9.5
Washington	54.0	13	67.0
West Virginia	17.0	10	27.0
Wisconsin	38.0	10	48.0
Wyoming	12.0	0	12.0

Sources: Tobacco Institute (1992); Action on Smoking and Health (1993).

*Includes the District of Columbia.

†Sales tax information is for November 1, 1992.

had long been a problem, states reported that organized smuggling increased significantly after the tax increases of the mid- to late-1960s. Some states were discouraged from adding further taxes that would motivate increased smuggling and result in a net loss of revenues generated by cigarette taxes. In 1978, in response to pressure from states with high cigarette taxes, the Federal Contraband Cigarette Act (Public Law 95-575) was enacted. This act prohibited the single-transaction transport, receipt, shipment, possession, distribution, or purchase of more than 60,000 cigarettes not bearing the tax indicia of the state in which the cigarettes were initially sold. The act dealt only with the organized smuggling of cigarettes, described by the ACIR as the major problem, and ignored the less problematic casual smuggling (Kleine 1993). The ACIR (1985) suggests, however, that the law was even more effective than its proponents would have predicted.

California and Massachusetts recently enacted two large increases in their excise taxes on tobacco. In November 1988, California voters passed Proposition 99, which went into effect in January 1989. This law increased California's state excise tax on cigarettes from 10 cents per pack to 35 cents per pack. As was mentioned earlier, one of the notable features of Proposition 99 is that 20 percent of the additional revenue raised from the tax increase is earmarked for the state's antismoking activities. Legislation similar to Proposition 99 was passed in Massachusetts in November 1992. This measure, which took effect on January 1, 1993, includes a 25-cent increase in the state excise tax and a 25 percent increase in the tax on chewing tobacco.

Besides the specific taxes applied to cigarettes, 45 states and Washington, D.C., have general sales-taxes that apply to cigarettes. In all but four of these states, the sales-tax base includes the excise tax. This arrangement adds an additional 5 to 14 cents per pack to the price of cigarettes in these states (see Table 13).

State taxes on other tobacco products have also become more widespread. By January 1, 1992, a total of 37 states had imposed a tax on at least some tobacco products other than cigarettes; only 14 states were collecting such taxes in 1964. The same time period witnessed similar activity at the local level. By fiscal year 1991, 373 cities had imposed additional taxes on cigarettes, and 49 cities were levying taxes on other tobacco products. In addition, 38 counties were charging their own cigarette taxes, and 29 counties were assessing additional taxes on other tobacco products. The largest of these local cigarette taxes are those imposed in New York City (8 additional cents per pack) and in Chicago (24 additional cents per pack, including city and county excise taxes).

Cigarette Tax Increases and Cigarette Prices

After scientific evidence of the harmful health consequences of cigarette smoking appeared in the mid-1950s, states began to increase cigarette excise taxes not only to raise revenues but to discourage people from smoking. Because the combined federal and state taxes accounted for almost half of the average retail price of cigarettes, these state tax increases resulted in increases in the real price of cigarettes (i.e., the price of cigarettes relative to the price of all goods and services, as measured by the National Consumer Price Index) (Table 14). The relative price of cigarettes also rose as a result of the state tax increases. This trend was accelerated after the 1964 release of the first Surgeon General's report on smoking and health. The result was that between 1955 and 1971, the nominal price of cigarettes had risen by over 70 percent (almost half of this increase was attributed to the state tax increases), and the real price of cigarettes had risen by over 13 percent.

These increases in real cigarette prices were short-lived. The rapid inflation of the 1970s, coupled with the relative stability of state excise taxes on cigarettes, led to a sharp drop in real cigarette prices between 1971 and 1981. Federal taxes remained fixed at 8 cents per pack during this period. As was discussed earlier, the emergence of organized smuggling in response to the growing differences in state and local taxes discouraged states from continuing to increase cigarette taxes. Combined federal and state taxes, as a percentage of retail cigarette prices, fell from 47 percent at the beginning of this period to 33 percent in 1981. The absolute cost of producing cigarettes fell throughout this period, largely because of a decrease in the average quantity of tobacco per cigarette as the market share for "low tar" cigarettes increased (Harris 1987). The overall result was that between 1971 and 1981, the real price of cigarettes declined by almost 28 percent.

Beginning in 1982, this downward trend in real cigarette prices was reversed as state taxes rose in anticipation of the doubling of the federal excise tax on cigarettes that was scheduled for January 1, 1983. These combined tax increases led to the largest single-year jump in prices (from 1982 to 1983). However, Harris (1987) argues that the main cause of the increase in the real price of cigarettes from 1981 through 1986 was not the increase in either the federal tax or state taxes, but rather the increases in the wholesale prices of cigarettes because of markups by manufacturers. He contends that most of these markups were not justified by increases in the cost of production. Instead, he suggests that markups were the result of a coordinated price increase by the six firms that dominate the tobacco industry. More recent data lend support to Harris's argument: although state and

Table 14. Cigarette taxes and cigarette prices per pack, 1955–1991

Year	Average state tax (cents)	Average federal tax (cents)	Average cigarette price (cents)	Taxes as percentage of average price[*]	Real[†] average state tax[‡] (cents)	Real[†] average federal tax (cents)	Real[†] average cigarette price (cents)
1955	3.5	8.0	22.7	48.7	13.1	29.9	84.7
1956	3.8	8.0	23.2	47.4	14.0	29.9	85.3
1957	3.9	8.0	23.8	48.8	13.9	28.5	84.7
1958	4.0	8.0	25.0	48.0	13.8	27.7	86.5
1959	4.2	8.0	25.6	46.6	14.4	27.5	88.0
1960	4.7	8.0	26.1	48.9	15.9	27.0	88.2
1961	4.7	8.0	26.1	48.6	15.7	26.8	87.3
1962	5.1	8.0	26.9	48.3	16.9	26.5	89.1
1963	5.2	8.0	26.8	49.4	17.0	26.1	87.6
1964	5.6	8.0	27.9	49.3	18.1	25.8	90.0
1965	5.9	8.0	28.2	49.8	18.7	25.4	89.5
1966	6.9	8.0	30.0	51.4	21.3	24.7	92.6
1967	7.1	8.0	30.5	50.8	21.3	24.0	91.3
1968	8.4	8.0	32.3	49.2	24.1	23.0	92.8
1969	9.1	8.0	32.8	48.9	24.8	21.8	89.4
1970	10.2	8.0	37.1	47.7	26.3	20.6	95.6
1971	10.7	8.0	38.9	46.8	26.4	19.8	96.0
1972	11.6	8.0	40.0	47.7	27.8	19.1	95.7
1973	12.1	8.0	40.3	48.4	27.3	18.0	90.8
1974	12.1	8.0	41.8	47.6	24.5	16.2	84.8
1975	12.2	8.0	44.5	44.5	22.7	14.9	82.7
1976	12.4	8.0	47.9	41.4	21.8	14.1	84.2
1977	12.5	8.0	49.2	40.5	20.6	13.2	81.2
1978	12.9	8.0	54.3	37.1	19.8	12.3	83.3
1979	12.9	8.0	56.8	35.5	17.8	11.0	78.2
1980	13.1	8.0	60.0	34.5	15.9	9.7	72.8
1981	13.2	8.0	63.0	33.1	14.5	8.8	69.3
1982	13.5	8.0	69.7	29.9	14.0	8.3	72.2
1983	14.7	12.0	81.9	26.8	14.8	12.0	82.2
1984	15.3	16.0	94.7	33.2	14.7	15.4	91.1
1985	15.9	16.0	97.8	32.3	14.8	14.9	90.9
1986	16.2	16.0	104.5	30.8	14.8	14.6	95.3
1987	16.9	16.0	110.0	29.9	14.9	14.1	96.8
1988	18.2	16.0	122.2	28.1	15.4	13.5	103.3
1989	21.8	16.0	127.5	26.5	17.6	12.9	102.8
1990	24.7	16.0	144.1	26.4	18.9	12.2	110.3
1991	25.9	20.0	153.3	25.6	19.0	11.7	112.6

Source: Tobacco Institute (1992).

[*] Percentages cannot be calculated directly from the tax and price information, since taxes are weighted average taxes for the entire fiscal year, whereas prices and percentages are generally as of November 1.

[†] Real taxes and prices are obtained by dividing the actual taxes and prices by the National Consumer Price Index, with the average of 1982–1984 being the benchmark. All data are for the fiscal year ending June 20.

[‡] State taxes are a weighted average of the tax in taxing states, including Washington, D.C. (42 in 1955, 51 in 1970 and after). Price refers to the median retail price in all taxing states.

federal taxes have increased since the late 1980s, the percentage of the retail price of cigarettes accounted for by these taxes actually fell from 33 percent in 1981 to 26 percent in 1991 (Tobacco Institute 1992). The combined effect of increases in federal and state taxes and in manufacturer's price resulted in the real price of cigarettes increasing by over 60 percent between 1981 and 1991. This upward trend in real cigarette prices is expected to continue at least through 1993, as the federal tax increases to 24 cents per pack as part of the 1990 deficit-reduction agreement. Therefore, although taxes accounted for a smaller percentage of the increased retail price of cigarettes from 1981 to 1991, the increased taxes, along with manufacturers' price increases, were still passed on to consumers, and the real price of cigarettes increased.

Effect of Excise Taxes on Tobacco Use

One of the fundamental principles of economics, illustrated by a downward-sloping demand curve, states that as the real price of any commodity rises, consumption of that commodity falls. Some researchers have speculated that the consumption of an addictive product, such as cigarettes, might be an exception to this rule. However, numerous econometric studies, including several recent studies that explicitly model the addictive aspects of cigarette smoking, confirm that this fundamental economic principle does indeed apply to cigarettes. Thus, since increases in cigarette excise taxes generally result in increased cigarette prices, these tax increases may be effective in reducing cigarette consumption.

Economists use the concept of price elasticity of demand to describe the sensitivity of consumption to changes in price. The price elasticity of demand is defined as the percentage change in consumption that results from a 1 percent increase in price. For example, a price elasticity of -0.5 implies that a 10 percent increase in price would reduce consumption by five percent. A brief review of recent U.S. studies of cigarette demand follows.

Aggregate Data Studies

One set of recent studies of cigarette demand used aggregate data. Price elasticity estimates obtained from these studies ranged from -0.14 to -1.23; the majority of these estimates fell within the narrower range from -0.20 to -0.50. All but two of the estimates were obtained from econometric studies that besides examining the effect of price, used income, demographic variables, and other policy-related variables to explain differences in cigarette consumption. Failing to include such potentially important determinants of demand could lead to biased estimates of the effects of price and other policies on cigarette smoking. Several of these studies made theoretical and empirical attempts to model the addictive aspects of cigarette consumption. In contrast with the econometric analyses, Peterson et al. (1992) used an epidemiologic approach similar to the quasi-experimental approach of Baltagi and Goel (1987). Both studies obtained estimates of the price elasticity of demand that were consistent with those obtained from econometric studies.

Differences in the estimates obtained from these studies partly resulted from differences in theoretical and empirical modeling methods. For example, the studies that used a pooled time series of state cross-sections might provide estimates of the price elasticity that exceed the true value of the elasticity if cigarette smuggling is ignored, since studies based on aggregate data use state cigarette sales figures as their measure of consumption. That is, states with relatively low cigarette taxes and prices may sell a substantial number of cigarettes to residents of nearby states where prices are higher. Thus, the sales figures from the states with lower cigarette taxes and prices will overstate cigarette consumption within those states, whereas those with higher taxes and prices will understate consumption. Many of the most recent studies, however, including those by Baltagi and Levin (1986), Becker, Grossman, and Murphy (1992), and Chaloupka and Saffer (1992), have controlled for this problem. Similarly, if the addictive aspects of consumption are ignored, the estimated price elasticity may be biased. Again, many of these recent studies, including Baltagi and Levin (1986), Becker, Grossman, and Murphy (1992), and Keeler et al. (1992) estimated demand equations that explicitly model the addictive aspects of consumption. In addition, at the aggregate level, cigarette prices and quantity are simultaneously determined by the interaction of cigarette supply and demand. Ignoring this simultaneity would lead to biased estimates of the effects of cigarette prices on demand. Bishop and Yoo (1985) and Porter (1986) explicitly modeled this relationship and estimated price elasticities of demand that fell within the -0.20 to -0.50 range generally found in other studies based on aggregate data. Finally, two of these studies, Keeler et al. (1992) and Flewelling et al. (1992), considered the effects of the relatively large change in the California cigarette excise tax. Their estimated price elasticities suggest that the impact of price on demand is independent of the level of price.

Even with the differences in data, theoretical modeling, and estimation techniques, one general conclusion can be drawn from these aggregate studies—increases in cigarette prices will reduce cigarette consumption. At least part of this reduction is likely due to adolescents' quitting smoking, reducing the amount they smoke, or not taking up smoking in the first place (USDHHS 1991).

Microlevel Data Studies

Another set of recent studies of cigarette demand include those that used microlevel data—that is, data from groups of individuals instead of aggregate data sets. As with the studies that used aggregate data, these studies consistently indicated that cigarette smoking is affected negatively by price. Each of the studies carefully dealt with the smuggling problem that could bias the estimates of the price elasticities. Because they were based on microlevel data, the studies also avoided the simultaneity problems that arise when working with aggregate data. That is, no individual smoker consumes enough cigarettes to affect market price, so prices could be appropriately treated as exogenous in these studies.

Many of these studies, however, examined issues that cannot be addressed when using aggregate data. Studies that use microlevel data can assess the effect of prices and other policies, not only on average cigarette consumption (the focus of aggregate studies), but also on the probability that an individual smokes and on average consumption among smokers. Similarly, the effects of policy variables on smoking initiation and cessation can be explored. Microlevel data can be used to consider the differential effects of increased cigarette excise taxes and other policies on alternative demographic groups (by age or by gender, for example).

Lewit and Coate (1982) took advantage of cross-sectional survey data not only to estimate equations of the demand for cigarettes, but also to determine smoking prevalence and patterns of smoking participation. In addition, this study estimated separate demand equations for different age groups (20–25 years, 26–35 years, and 36–74 years) and for men and women. These investigators found that a price increase appeared to effect the decision to become a smoker rather than the decision to smoke less frequently. They also found that the smoking behavior of young adults (20 to 25 years old) was more sensitive to price changes than that of older individuals. Finally, they found that male smokers, particularly those aged 20 to 35 years, were quite responsive to price, whereas female smokers were essentially unaffected by price.

Mullahy (1985) introduced myopic addiction (i.e., the concept that addiction outweighs an individual's foresight or concern for future well-being) into his theoretical model of cigarette smoking. This model implies that at any given time, smoking initiation, regular use, and the amount of cigarettes smoked depend on an individual's smoking history. This model and other studies that formally model the addictive aspects of smoking incorporate the concepts of tolerance, reinforcement, and withdrawal that distinguish addictive consumption from nonaddictive consumption. Treating smokers as myopic, however, implies that the future consequences of their smoking are ignored when they make current decisions. Mullahy estimated separate demand equations for men and women and found that both the decision to smoke and the quantity of cigarettes consumed by smokers were negatively related to cigarette prices for each gender. As in the Lewit and Coate study, Mullahy found that cigarette prices had a greater impact on the decision to smoke than they do on cigarette consumption. Similarly, he found that men were somewhat more responsive to price than women (average elasticities of -0.56 and -0.39, respectively).

Chaloupka (1990, 1991a, b) applied the Becker and Murphy (1988) model of rational addictive behavior to cigarette smoking. As in the Mullahy model, addiction is accounted for by recognizing that current smoking decisions depend on past smoking, whereas rationality implies that the future consequences of an individual's past and current smoking behavior are considered when making current choices. Chaloupka found both that cigarette smoking is addictive—that is, it depends on past smoking—and that individuals who smoke also consider future consequences. He found that increases in cigarette prices reduce average cigarette consumption significantly and that the effects of price increases on consumption are understated if the addictive aspects of consumption are ignored. In contrast with the findings of Lewit and Coate, Chaloupka found that adolescents and young adults (aged 17 through 24 years) were less responsive to price than are older age groups. Chaloupka also found, like Lewit and Coate, that women were much less responsive to price than men.

Wasserman et al. (1991) used several of the Health Interview Surveys conducted during the 1970s and 1980s to estimate the effects that taxes and regulations restricting smoking in public places have on adult cigarette demand. These investigators also examined whether the price elasticity of demand has changed over time. Using a generalized linear model, they found that the negative impact of cigarette prices on demand has increased over time. The estimated price elasticity of demand in 1970 (0.06) suggested that increases in cigarette excise taxes would not discourage cigarette smoking. However, the authors estimated an increasingly negative effect of cigarette prices on demand from 1974 (-0.17) through 1985 (-0.23). They estimated that by 1988, the price elasticity of demand would increase (in absolute value) to -0.28. This finding that the price elasticity of demand is becoming more negative over time contradicts the findings of the studies based on aggregate data by Baltagi and Goel. The estimated elasticities of Wasserman et al. were approximately half those estimated by Lewit and Coate, who used the same data. Wasserman et al. attributed these relatively low estimates to their including an index that measured state-level antismoking regulations and was highly correlated with price. When this index was omitted, the effects of price on demand were overstated, since they included the true price effect as well as the effect of the omitted regulations. The findings of Wasserman et al. for youth will be discussed in detail in the next section.

The implications of these studies on older adolescents' and young adults' responsiveness to price are not conclusive. Lewit and Coate's examination of individuals 20 years old and older concluded that upward price elasticity is increasingly negative (and thereby has a stronger effect) for younger age groups. The addictive model that Chaloupka used, however, suggested that less addicted smokers (those who have a shorter history of smoking, for example) will be less responsive to price than their more addicted counterparts. His estimated long-run price elasticities of demand for older adolescents and young adults were consistent with this hypothesis. The following section addresses more specifically the effect of price on the smoking behavior of young people.

Price Responsiveness of Adolescent Smokers

A third set of recent econometric studies focused on youth. Each of these studies, as with the studies of adult smoking that employ microlevel data, carefully controlled for cigarette smuggling. Besides including cigarette prices and other determinants of demand employed in the studies of adult smoking, these youth studies included parental characteristics (such as education level and income) as proxies for parental smoking practices, which have been shown to be associated with youth smoking.

The first comprehensive studies of the price responsiveness of cigarette smoking among youth were completed in the early 1980s. Lewit, Coate, and Grossman (1981) used Cycle III of the Health Examination Survey (HES-III), which was conducted from March 1966 through March 1970, to look at the effects of cigarette prices, of the negative cigarette advertising broadcast under the Fairness Doctrine, and of various socioeconomic and demographic factors affecting cigarette smoking by youth (persons 12 through 17 years old). Besides examining average cigarette consumption among all youth, the authors also estimated equations for smoking participation for all youth as well as equations for cigarette demand for young smokers. This methodology, similar to that used by Lewit and Coate, allowed the authors to distinguish the effect of price on the decision to smoke from its effect on smokers' consumption of cigarettes. The authors found that most of the impact of prices on cigarette smoking was on the decision to smoke rather than on smokers' average consumption of cigarettes: estimated price elasticity was -1.20 for smoking participation and -0.25 for cigarette demand. Furthermore, the estimated price elasticity of demand among youth in this study (-1.44) was more than three times as high as the estimate for adults in Lewit and Coate's study and nearly two times as high as that study's estimate for young adults (persons aged 20 through 25 years).

These findings were mostly confirmed in a related study by Grossman et al. (1983). This study used data from the 1974, 1976, 1977, and 1979 National Household Surveys on Drug Abuse. The surveys were analyzed separately because of differences in the definition of smoking. As the authors noted, the estimates from this study should be interpreted cautiously, since the sample sizes were much smaller than those of the study based on the HES-III. In general, Grossman et al. found that the decision to smoke was negatively related to the price of cigarettes; their summary estimate of this elasticity was -0.76. Again, this estimate was substantially higher, in absolute value, than that obtained for adults by Lewit and Coate, and it implies that young people's decision to smoke is much more responsive to price than the comparable decision for adults. However, Grossman et al. found that once the decision to smoke has been made, average consumption decisions by young smokers were virtually unresponsive to price.

Warner (1985, 1986) used the age-specific price elasticities of participation and demand from Lewit and Coate to obtain comparable estimates of price elasticity for teenagers (persons aged 12 through 17 and 18 through 19). He used these age-specific data to estimate that the doubling of the federal excise tax in 1983 reduced the number of teenage smokers by 800,000, assuming that average cigarette prices increased by the 8 cents that the tax increased. These estimates form the basis for a U.S. General Accounting Office (GAO) report, which concluded that raising the federal tax further by 20 cents per pack would have reduced the number of teenage smokers by an additional 500,000 in 1989 (GAO 1989). The GAO predicted a subsequent reduction of 125,000 smoking-related deaths for this age group as a result of the proposed 20-cent tax increase.

Similarly, Harris (1987) used the Lewit, Coate, and Grossman estimates, among others, to examine the effects that the 1983 doubling of the federal excise tax on cigarettes had on cigarette smoking and health. He concluded that the tax increase and the coordinated price increases it induced kept 600,000 teenagers (persons aged 12 through 17 years) from starting to smoke. Basing his findings on epidemiologic studies of the 1950s, 1960s, and 1970s, Harris concluded that 54,000 more teenagers would live to age 65 as a result of this tax.

The recent study by Wasserman et al. (1991) contradicted the general conclusion of Lewit and Coate that teenage cigarette smoking is more responsive than adult smoking to changes in cigarette prices. Wasserman et al. used the Second National Health and Nutrition Examination Survey (1976–1980) (NHANES-II) to estimate the effects of cigarette prices and antismoking regulations on cigarette smoking by youth aged 12 through 17. In both the generalized linear models and the two-part models they estimated, the authors found a statistically insignificant effect of cigarette prices on average cigarette consumption among all youth, on smoking participation rates among all youth, and on cigarette consumption by young smokers. Given the range of estimates obtained, the investigators could not reject the hypothesis that the price elasticity of demand for teenagers was statistically different from their estimate of -0.23 for adults. Their estimates for youth were consistent with Chaloupka's (1991b) young adult estimates, which also employed NHANES-II data. As was discussed earlier, Wasserman et al. suggested that one of the reasons for their relatively low estimated price elasticity of demand was their including an index that captured antismoking regulations as a determinant of demand. Thus, they concluded that the price effects estimated in other studies may have been biased upwards, since prices alone were being credited with the effects of various contemporaneous antismoking regulations that likely played an important role in discouraging young people from smoking.

Grossman (1991) noted, however, that the study by Wasserman et al., while a valuable contribution to the empirical literature on cigarette demand, should not be considered as offering the definitive estimates of the price elasticity of demand, particularly for youth. Others, including Chaloupka (1988) and Chaloupka and Saffer (1992), did not find that the estimated price elasticity of demand was sensitive to the inclusion of measures of antismoking regulations, although these other studies used smaller sample sizes than did Wasserman et al. Furthermore, including the regulation index may be less relevant in a teenage sample, since the index assumes its highest value in states that restrict smoking in private worksites. If the regulations themselves have no direct impact on smoking, but are instead proxies for antismoking sentiment, then enacting very restrictive measures may not necessarily reduce youth smoking. For example, during the 1980s, restrictions on public smoking were enacted across the United States, yet smoking onset rates among young people did not decline significantly (see "Trends in Cigarette Smoking" in Chapter 3). Finally, the Wasserman et al. (1991) findings for a relatively small sample of youth (N = 1,891) should be interpreted cautiously when compared with those obtained by Lewit, Coate, and Grossman (1981) (N = 5,308).

Discussion

The large amount of empirical literature on the relationship between cigarette prices and cigarette smoking suggests that increased excise taxes on cigarettes would significantly reduce overall rates of cigarette smoking. Much of the impact of higher prices would come from encouraging cessation among current smokers and discouraging initiation among young smokers. The price responsiveness of adolescents is at least as high, if not significantly higher, than that of adults—a finding that suggests that an increase in cigarette taxes would result in large reductions in smoking prevalence and cigarette consumption among teenagers.

Although numerous studies of aggregate cigarette demand and several studies of cigarette smoking among youth have been completed in recent years, the relationship between other tobacco taxes and the use of tobacco products other than cigarettes has not been examined.

Tax Policies Under Consideration

Increased taxes on cigarette and other tobacco products have been widely used in recent years as a source of federal, state, and local revenue. These taxes also are seen as a way to improve public health by discouraging cigarette smoking. Two proposals discussed in the 1989 Surgeon General's report on smoking and health (USDHHS 1989) have received the most attention. The first proposal is to increase tobacco taxes in general and to change the way in which these taxes are calculated. The second proposal would earmark the revenue generated by tobacco taxes to pay for tobacco-control programs or the health care costs related to smoking. Most of the proposals discussed below concern cigarette taxes; similar policies could be adopted for taxes on other tobacco products as well.

Increasing Tobacco Taxes

An increase in the federal excise tax on cigarettes is the most widely supported tax policy proposal. Proponents—which include a number of public health groups, such as the American Lung Association, the AMA, the ACS, the American Heart Association, and the American Public Health Association—argue that the cigarette tax should be increased, because even after recent increases, the real value of the tax is still well below what it was in 1951. Also suggested is the repeal of the federally approved exemption for state taxes of cigarette sales on military bases and Native American reservations.

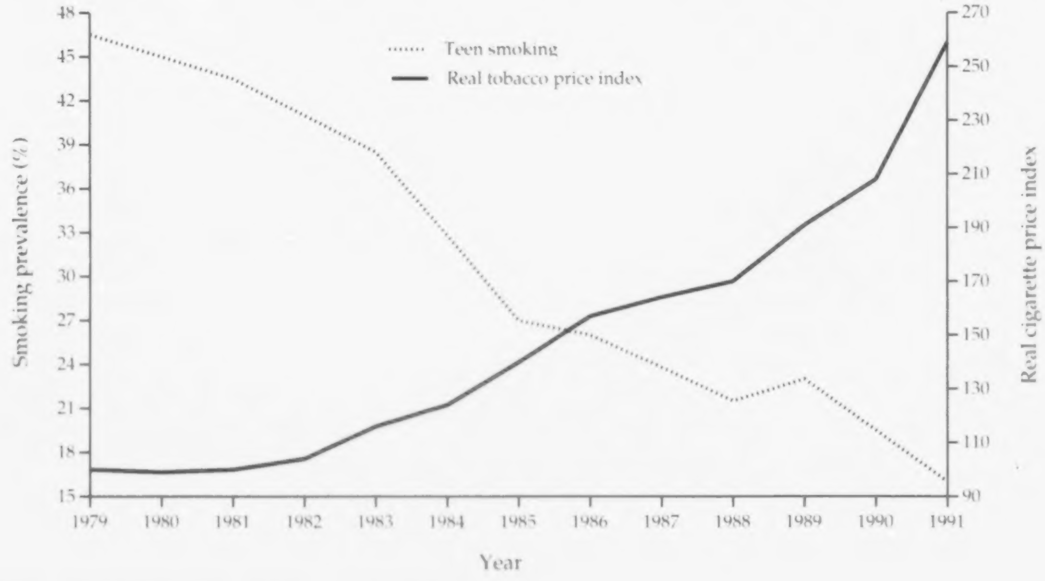
Similarly, despite recent increases in state excise taxes on cigarettes, the average state's real excise tax on cigarettes is at about the same level as it was shortly after the release of the first Surgeon General's report on smoking and health. In several states (notably the large tobacco-producing states), the effects of inflation have been allowed to substantially reduce the values of these taxes. Although additional tax increases in states that have continually raised their cigarette excise taxes over time could spur a return to the organized smuggling of the 1970s, this problem possibly could be solved by levying larger tax increases in the states that have relatively low cigarette taxes and by instituting a tax in the four states that currently exclude cigarettes from the in-state sales tax.

These tax increases would raise cigarette prices in the short run; without continued increases, however, the real value of the tax would be reduced by inflation over time. Given the importance of taxes in cigarette prices, the real cigarette price could even decline, as it did from 1971 to 1981. An alternative might be to replace the excise tax with an ad valorem tax, which would increase proportionately as the nontaxed price of cigarettes increases. The federal government imposes an ad valorem tax on large cigars only, and most states levy ad valorem taxes on tobacco products other than cigarettes.

An ad valorem tax, however, may have an unintended consequence of lulling the public's awareness of a tax increase, since ad valorem taxes may be perceived—and accepted—as part of overall inflation. Periodic increases in excise taxes, on the other hand, may be publicized each time they occur and thus may stimulate public discussion of the health effects of smoking. Canada's experience with ad valorem taxes suggests that any mechanism that raises cigarette prices will be effective in reducing cigarette smoking.

To offset declines in real revenues due to inflation, Canada switched to an ad valorem tax on cigarettes at both the federal and provincial levels in the 1980s. These ad valorem taxes were partly responsible for a 25 percent increase in real cigarette prices, which was accompanied by a 10 percent decline in adult consumption of cigarettes (Sweanor 1991). In 1984, however, the ad valorem tax system was dropped after heavy lobbying by the tobacco industry and a lack of support from public health groups. Since then, there have been large increases in both federal and provincial excise taxes. By June 1, 1991, the average total tax on a pack of 20 cigarettes in Canada was $3.72, more than eight times what it was in 1980 and approximately seven times the average in the United States. The large increases in Canadian taxes since 1985 are estimated to have reduced adult consumption by 35 percent and teenage consumption by 62 percent. These data included tobacco imported from the United States (Sweanor 1991; see Figure 6). Canada's experience in the 1980s provides a nationwide example of the effect of a tax increase on cigarette smoking among young people.

Figure 6. Real* cigarette prices and cigarette smoking prevalence among Canadians aged 15–19 years, 1979–1991



Sources: Health and Welfare Canada (1991); Sweanor (1992).
*The price of cigarettes relative to the price of all goods and services in Canada, adjusted for inflation with 1979–1980 being the benchmark years.

Related proposals include indexing the federal cigarette excise tax to the rate of inflation or to some measure of cigarette prices. Each of these proposals would have the benefit of offsetting the effects of inflation on the value of the taxes and tax revenue over time, and each would be only slightly more cumbersome to administer than current tax structures.

Opponents of these tax changes argue that increases would place an unfair burden on the poor. In general, excise taxes and other consumption taxes are regressive, in that they require lower-income individuals to pay a greater share of their incomes in taxes. The CBO estimates that increased cigarette excise taxes would most affect individuals in the lowest income categories (CBO 1990). However, as the CBO also explains, alternative tax and transfer policies could offset the regressiveness of a tax increase. Proponents of these tax changes point out that lung cancer and other smoking-related diseases also disproportionately affect the poor; moreover, if the tax revenues are earmarked to programs directed to the poor, then the overall policy is not regressive.

Another side effect of an increase in the federal tax on cigarettes would be the reduction of state and local cigarette tax collections as cigarette consumption falls. On the other hand, if state taxes on cigarettes increase with federal taxes, state revenues could increase as well, as occurred in 1983. Lastly, opponents of tax changes argue that increases in taxes would also increase incentives to evade taxes. The CBO estimates, however, that any resulting increases in tax evasion would be relatively minor.

Earmarking Taxes

The apparent success of Proposition 99 in California has increased interest in adopting similar policies elsewhere. Of the revenues generated from the tax increase of 25 cents per pack, 20 percent are dedicated to antismoking education, 5 percent to research, 5 percent to environmental and other specified programs, and 70 percent to medical care for the poor. Recent attempts by the governor to redirect some of these revenues to other purposes were stopped by the state courts. Similar earmarking of part of the state excise on cigarettes takes place in Nebraska (for its cancer and smoking research program), Minnesota (for the state public health fund), Utah (for its tobacco-control programs), and Indiana (for subsidizing of child care). Earmarking the revenues from tobacco taxes to tobacco-control programs reinforces the impact that increased tobacco taxes have on tobacco consumption. Early evidence from California (Flewelling et al. 1992; Keeler et al. 1992) indicates that the combined impact of the increased excise tax on cigarettes and the increased tobacco-control activities funded by these tax increases has resulted in reduced cigarette consumption.

On its November 1992 ballot, Massachusetts passed a measure similar to Proposition 99. This measure institutes a state excise tax increase of 25 cents per cigarette pack and a 25 percent increase in the tax on chewing tobacco. Some of the revenue from the increases may be dedicated to tobacco-control programs. Public health professionals in Colorado, Nebraska, Arkansas, Michigan, and Oregon are advocating similar measures. These types of large increases in cigarette excise taxes, where at least part of the increased revenues is earmarked for other antismoking activities, have the added advantage of stimulating the discussion of the health consequences of smoking. As a result, reductions in smoking may be larger than anticipated.

Conclusions

This chapter reviewed a large body of literature concerning programs and policies to prevent tobacco use among young people. These measures, from education to taxation, are strongly supported by the United States public. Given the number of young people who continue to initiate use during adolescence, and given the strong role of the social environment in the process of initiation, efforts to prevent the onset of tobacco use may need multiple, complementary components, including those described in this chapter, and may need to be implemented at the national, state, and community levels to have long-term impact.

1. Most of the American public strongly favor policies that might prevent tobacco use among young people. These policies include tobacco education in the schools, restrictions on tobacco advertising and promotions, a complete ban on smoking by anyone on school grounds, prohibition of the sale of tobacco products to minors, and earmarked tax increases on tobacco products.
2. School-based smoking-prevention programs that identify social influences to smoke and teach skills to resist those influences have demonstrated consistent and significant reductions in adolescent smoking

prevalence, and program effects have lasted one to three years. Programs to prevent smokeless tobacco use that are based on the same model have also demonstrated modest reductions in the initiation of smokeless tobacco use.

3. The effectiveness of school-based smoking-prevention programs appears to be enhanced and sustained by comprehensive school health education and by communitywide programs that involve parents, mass media, community organizations, or other elements of an adolescent's social environment.
4. Smoking-cessation programs tend to have low success rates. Recruiting and retaining adolescents in formal cessation programs are difficult.
5. Illegal sales of tobacco products are common. Active enforcement of age-at-sale policies by public officials and community members appears necessary to prevent minors' access to tobacco.
6. Econometric and other studies indicate that increases in the real price of cigarettes significantly reduce cigarette smoking; young people are at least as responsive as adults to such price changes. Maintaining higher real prices of cigarettes depends on further tax increases to offset the effects of inflation.

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Glossary

AA	*Advertising Age*
AAFP	American Academy of Family Physicians
AAP	American Academy of Pediatrics
ACIR	Advisory Committee on Intergovernmental Relations
ACS	American Cancer Society
ADAMHA	Alcohol, Drug Abuse, and Mental Health Administration
AG	Attorney General
AIDS	acquired immunodeficiency syndrome
AMA	Americal Medical Association
ANR	Americans for Nonsmokers' Rights
APA	American Psychiatric Association
ASSIST	American Stop Smoking Intervention Study for Cancer Prevention
ASTHO	Association of State and Territorial Health Officials
AUTS	Adult Use of Tobacco Survey
B&W	Brown and Williamson
CBO	Congressional Budget Office
CBS	Columbia Broadcasting System, Inc.
CDC	Centers for Disease Control and Prevention
CLASP	Counseling Leadership About Smoking Pressure
COMMIT	Community Intervention Trial for Smoking Cessation
COPD	chronic obstructive pulmonary disease
COURSE	Communication Through Open Minds, Understanding, Respect, and Self-Esteem
CSTHEA	Comprehensive Smokeless Tobacco Health Education Act
DOC	Doctors Ought to Care
EEG	electroencephalograph
ETS	environmental tobacco smoke
FDA	Food and Drug Administration
FEF	forced expiratory flow
$\mathbf{FEF}_{25\text{-}75}$	forced expiratory flow from 25 to 75 percent of forced vital capacity
$\mathbf{FEV}_1$	forced expiratory volume in one second
FTC	Federal Trade Commission
GAO	General Accounting Office
HDL	high-density lipoprotein
HES-III	Cycle III of the Health Examination Survey
HIV	human immunodeficiency virus
HMO	health maintenance organization
ISR	Institute for Social Research
ITL	Imperial Tobacco Ltd.
K.I.D.S.	Kids Inhaling Dangerous Smoke
MPP	Midwestern Prevention Project
MS	mainstream smoke
MSPP	Minnesota Smoking Prevention Program
MTFP	Monitoring the Future Project
NASBE	National Association of State Boards of Education
NBC	National Broadcasting Company, Inc.
NCHS	National Center for Health Statistics
NCI	National Cancer Institute
NHANES-II	Second National Health and Nutrition Examination Survey
NHIS	National Health Interview Surveys
NHSDA	National Household Surveys on Drug Abuse
NIDA	National Institute on Drug Abuse
NIH	National Institutes of Health

NSBA	National School Boards Association
NTTS	National Teenage Tobacco Surveys
OSH	Office on Smoking and Health
PATCH	Planned Approach to Community Health
PCP	phencyclidine
PDAY	Pathobiological Determinants of Atherosclerosis in Youth Research Group
PEFR	peak expiratory flow rate
PHS	Public Health Service
PM	Philip Morris
PTA	Parent Teacher Association
RJR	R.J. Reynolds
RJR-M	R.J. Reynolds-MacDonald
SAMHSA	Substance Abuse and Mental Health Services Administration (formerly Alcohol, Drug Abuse, and Mental Health Administration)
SAVES	Smoking Activity Volunteer-Executed Survey
SES	socioeconomic status
SEU	subjective expected utility
SHOUT	Students Helping Others Understand Tobacco
SIDS	sudden infant death syndrome
SMART	Self-Management and Resistance Training
SODAS	Stop, Options, Decide, Act, and Self-Praise
SS	sidestream smoke
STAT	Stop Teenage Addiction to Tobacco
TAPS	Teenage Attitudes and Practices Survey
TGIF	Thank God It's Friday
TNT	Toward No Tobacco Use
TV	television
USDHEW	U.S. Department of Health, Education, and Welfare
USDHHS	U.S. Department of Health and Human Services
USEPA	U.S. Environmental Protection Agency
USTJ	*U.S. Tobacco Journal*
WHO	World Health Organization
YRBS	Youth Risk Behavior Survey
YWCA	Young Women's Christian Association

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